GAS JOURNAL

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REFRACTORIES

THE 38th Report on Refractory Materials, so ably and amiably presented to the Institution of Gas Engineers at the autumn research meeting by Mr. A. T. Green, is a record of close and painstaking research and study of matters of vital importance to the gas and other carbonizing and fuel-using industries. The relatively small sums of money subscribed by the Gas Industry to defraying the expense of this work are not, we think, an adequate measure of that importance In saying this we are not unmindful of the staunch and sustained support which has been given by the Industry to the British Refractories Research Association since its inception What we have foremost in mind is that however highly developed and expensively designed the mechanical equipment of the retort house may be, unless the refractories are sound the money spent on labour-saving may easily be lost in maintenance. Money spent to ensure this soundness, the bases of which are still far from secure, is a very good investment indeed.

The refractories industry itself is, we should say, in a most satisfactory condition. The works of the manufacturers of repute are nowadays fully equipped with laboratories and technical staff for the scientific control of operations at all stages. And the co-operation between manufacturers and users could hardly be improved upon. Where then is the difficulty? One difficulty is fully in evidence in the section of the report dealing with the behaviour of firebricks in the after-expansion test. The difficulty we have in mind is that of sampling. It is comparatively easy to control the composition of the raw materials in the granular state. The problem there is not unlike that of sampling coal and coke with which the gas engineer is familiar. But serious changes take place in drying and kilning, and after the kiln sampling in the sense we have indicated is impossible. The most that can be done is to select samples, with intelligence, of course, but necessarily more or less at random. With one or two such samples in their possession it is not surprising that two laboratories, say that of the building contractor and that of the client, sometimes get different results "in spite of the most careful attention to testing procedure." Disputes may well result. The report records a further stage in the investigation, by no means exhausted, into the causes of these variations, in bricks of the same batch, and into the number of samples which it is necessary to test to obtain a mean value which shall represent with sufficient accuracy the true value of the batch.

The President of
The Institution of Gas Engineers
Dr. Harold Hartley and Mrs. Hartley
send to all members of the Institution and to other friends in and connected with the Gas Industry their Cordial Greetings and Best Wishes for Christmas and the New Year

Firebricks, as a class of refractories, are made from raw materials which differ widely in chemical and physical properties. This work seeks the explanation of the anomalous behaviour of certain firebricks under the standard after-expansion test. At the same time it seeks an alternative criterion by which the probable behaviour of a batch of material under operational conditions can be more accurately judged. The vagaries of behaviour under reheating of the apparently simple firebrick are being steadily tracked down and may soon be explained by a test designed to use as a criterion the temperature of initial change of length rather than the actual change itself as in the standard test, which result probably only represents the algebraic sum of opposing directional movements over the whole period of reheating.

The second section, a continuation of the study of the clay-quartz system, in other words of the siliceous and semi-silica types of refractories, is an example of the fundamental research which is always going on at the Mellor laboratories. We can never know too much about the occurrence and behaviour of the several allotropic forms of silica during kilning and in service. There is no finality here either. Mr. Green's workers look forward to a time when, understanding the mechanism of the "inversion characteristics of cristobalite," they may be able to "exert some degree of control over the inversion temperature. . . and over its accompanying undesirable effects in practice."

The virulence of ferrous oxide as a slagging medium is emphasized by the third section and this is allied to the study later in the report of the behaviour of refractories in carbonizing plant. The practical result of this work seem to be a confirmation of the view, already generally held, that high-silica bricks withstand the disrupting effects of iron oxide better than high-alumina bricks.

The two papers dealing with insulating materials record further advances in the study of a subject of increasing importance. The Industry would benefit considerably by the production of an insulating brick which would stand up to high temperatures and at the same time be possessed of sufficient mechanical strength to take its place in the main structure of the retort bench. So far this also must be regarded as work of a fundamental rather than a practical nature.

So far we have nothing but unqualified praise and approval to record of the Director's work and results. But when we come to his final section, on the behaviour of refractories in carbonizing plants—his post-mortem examination, which we have published in full in the "JOURNAL" (last week's issue

and later pages to-day)—we are not so sure. Why should we be? When Mr. Green first announced his intention of sending his men away from the laboratories and "into the field" we suggested that he should select a number of installations now being built and arrange for a complete log to be kept of each retort over a period of years, and that the log should be supplemented by periodical visits of inspection, also completely logged, by one or more members of the research staff. We are not sure whether it would not pay the Industry, and pay richly, to subsidize one or two research men to devote their whole time to the observation and recording of the operation of three or four or more typical installations, right from the very start of drying out, to the last year of their useful lives.

Because, frankly, we query whether the post-mortem examination will produce the desired result. We do not believe that "by making observations on a large number of retort settings let down for repairs or reconstruction, it may ultimately be possible to assess" the cause of death. We venture the opinion that few of the failures of retort material have been convincingly explained. The durability of refractories is dependent, as the report says, on the design and operation of the plant, the properties of the refractories, and those of the coals carbonized. Their failure is generally due to accidental departures from routine procedure. But these departures are exceedingly difficult to trace once the damage is done. And running down the definite cause of damage or failure is rendered all the more difficult because of that very spirit of friendly co-operation between builder and user to which we have referred. The damage is done; the next approach is to repair it with as little mutual friction as possible.

There are, however, some general propositions which do arise out of Dr. Heaton's observations and records. And may we add our meed of unstinted praise for this excellent piece of work, the last in a long series which he leaves behind him. First there is the point that more damage is done to retorts—and continuous vertical retorts in particular—in scurfing than in any other operation. And yet, while carbonizing operations are generally carefully supervised by competent technical men, this operation is generally left to the stoker. It is during scurfing alone that the internal face of the continuous vertical is open to visual inspection. This is the occasion when it should be carefully examined and kept under close supervision. Dr. Heaton found no relation between the method of scurfing and the beginning of disintegration, but we hardly think that this is the experience of those who have lived with verticals since their inception. "Downward" scurfing is of comparatively recent introduction, but we do not discern any difference of opinion on its advantages over the other method. With "upward" scurfing there is always the chimney effect of the retort liable to give rise to the passage of air upwards with excessive velocity and to the generation of a very high temperature of combustion of the scurf, entraining local fusion and cracking of the retort walls. All this is under much better control when the air is admitted at the top of the retort.

It may be doubted whether there is yet sufficient ground for some of the conclusions. Some are, we suggest, somewhat out of date. For instance, all the modern designs of vertical retort settings are tending towards the horizontal combustion flues with upward and/or lambent heating. There seems to be some confusion, at any rate "in the field," in the meanings to be attached to the terms "spalling" and "flaking" respectively. Spalling seems to take the form of a definite fracture of the brick or tile, very often almost parallel with the surface with associated fractures normal to the surface. It appears to be caused by physical conditions such as thermal shock, difference of expansion, and so on. Flaking seems to be a peeling-off of the surface such as might result from chemical attack. But we are not quite sure whether Dr. Heaton's mathematical analysis of the stresses set up by scurf attached to the refractory has any relation to reality. Scurf is deposited gradually on the surface and at the same temperature and it is not evident that the dislodging of pieces, "spalling," occurs only as temperatures rise and fall. "Flaking" says the report, "is restricted to the area in which scurf is formed," and "it always occurs in one position, the bottom half of the retort." Yet we recollect a case of several retorts which exhibited "flaking" to a practically even depth of an eighth of an inch uniformly over the whole length of the siliceous material.

There are at least two important aspects of retort life which are missing, perhaps inevitably, from these observations. The first is that of cracking. Cracking almost invariably takes place when settings and retorts are dried out and raised for the first time to carbonizing temperatures. The "airborne sealing" method described some little time ago by Mr. A. G. Bird ("JOURNAL" of April 24, 1946) should have been sufficiently long in systematic use in some works for its results to be showing themselves. And the second is that of jointing materials. Slagging and carbon penetration very often occur at this, perhaps the most vulnerable, part of the structure. Nothing in the report seems to bear on this.

In spite of what we have said, even though the suggestions put forward to explain the disruption of retort material in the varions zones are tantalizingly inconclusive and unconvincing, both manufacturers and carbonizers should give them their most careful consideration, the former with the single-minded view to possible improvements in texture and other properties and the carbonizer so that he may consider how he may reduce temperature fluctuations to the minimum during gas-making and, particularly, during scurfing.

CARBONIZATION AND THE CHEMICAL INDUSTRY

THE chemist used to be content with the by-products of the gas-making process to produce his marvels of dyes and drugs. Now he is claiming a share of the gas itself. This will not be very serious if he is satisfied with the "unsaturated hydrocarbons" which contribute no more than 1 or 2% towards the calorific content of the average gas—rising, however, to as much as 5 or 6% of horizontal retort gas at 560 B.Th.U. per cu.ft.

The address of Dr. John R. Campbell, of the Royal Technical College, Glasgow, at a recent joint meeting of the Eastern and Western Districts of the Scottish Junior Gas Association, must have taxed their powers of understanding to the utmost, fascinating as was the story he told them and masterly the manner in which the lecturer touched lightly over the complicated field of modern synthetic chemistry. We fancy, however, that his picture of the rôle of coal was a little distorted by his, understandable, predilection. In the past he said the function of coal had been to provide power and heat. This would be its function in the future "to a considerable extent," but as it is our only abundant source of carbon it must now act as the foundation of all our organic chemical industry. There is nothing wrong in the latter statement. Surely, however, coal must remain the source of practically all our power and heat, without which even our organic chemical industry cannot function.

Acetylene, said Dr. Campbell, will probably become the most important raw material for organic synthesis in the not too distant future, and we are short of cheap sources of electricity to prepare calcium carbide for its production by that method. He casts envious eyes on methane, realizing, however, that it may not be advisable to contemplate its entire removal from coal gas, to the heat content of which it contributes 40 to 50%. He looks rather to the synthesis of methane by the catalytic hydrogenation of coal and those

other methods, all of which have been occupying the attentions of the Gas Research Board for some years.

The list of preparations into which these products, not, it is to be noted, by-products, of carbonization can enter exhibits the same bewildering wealth as in former days. Plastics of all kinds, synthetic rubber, resins, synthetic liquid fuels, insecticides, synthetic fibres, detergents, drugs—all the bases of the equipment of modern life.

Dr. Campbell looks forward to a time when nylon, synthetic resins, and plastics may be manufactured at coke ovens and gas-works, and he ended his address on the note that the 40 million tons of coal carbonized per year in this country may suffice for all the requirements of the newer organic chemical industry. We fear that he will find that something substantially less than this quantity is handled by works big enough to install the plant and undertake the skilled operation necessary to the realization of his dream. But the address is a mine of information to those who need a compendious reference to the possibilities of the high-temperature treatment of coal, and this unusual contribution to the proceedings of a Junior Gas Association will be published in full in the December issue of "GAS."

LOW TEMPERATURE CARBONIZATION

Unfortunately, through indisposition, Colonel W. A. Bristow was unable to address the shareholders at the annual meeting of Low Temperature Carbonisation, Ltd., held this month in London. It is 20 years since Colonel Bristow was appointed Managing Director of the firm, and this annual meeting would have been the twenty-first to be addressed by him. As it was the Chairman's speech was read by Commander Colin Buist; and it was a speech full of vigour and optimism constituting a fine record of achievement during the past 12 months. We will not detail the achievement here, for we published the speech in our columns last week; but we may mention some of the points made which appear to us outstanding. Under private enterprise uninterrupted by nationalization of the coal industry, the year has been one of successful development. The profit, the amount carried forward, and the current assets of the group comprising Low Temperature Carbonisation are records. Demand for Coalite has far and away outstripped supply, and further batteries of retorts are in course of construction. It is hoped that these will be in operation in 1948. As to the sales of liquid products, export sales constituted about 40% of the total production; of this, by far the greatest proportion went to the United States of America. The contracts now outstanding for new plants for Coalite and liquid products amount to approximately £380,000. A year ago Colonel Bristow ventured the opinion that the demands for the oils and chemicals produced by the Company's form of low temperature carbonization would expand. His opinion has been thoroughly justified in the event. The Company's export trade has increased, and the amount of business offered has multiplied many times over.

Commentary by "Abaris"

Whooping Cough

Nothing is quite as unpleasant as whooping cough in very young children, for the effects are two-fold. The sufferer is usually physically exhausted after a bad bout and the parent is very often nearly driven to distraction by the inability to alleviate the trouble. Apart from this side there is also the sleeplessness that results from night-time coughing.

At one time a gas-works was popularly supposed to effect a cure, and I believe that even to-day some mothers place a certain measure of faith in the aromatic atmosphere engendered by carbonization. I am not aware which odour was alleged to be the most efficacious though I am aware of a definite fondness for the smell given off by tar; that is, I like the smell and my olfactory organ will never complain no matter how near a retort house it may be. I gather that some mothers made for the spent oxide heaps, and others went straight to the washers, so it isn't quite clear as to which part of the works did its job best. It is conceivable that the psychological effect on the exhausted mother was a welcome one, in that here was at least one hope of a cure.

More recently, trips in aeroplanes were alleged to give excellent results and many a hard-earned pound note has taken wings, with, alas, problematical results; but it does demonstrate that parents will attempt anything as long as it offers relief. Many a child has risen into the upper air, only to descend again with the monstrous affliction still gnawing at its bronchi.

Now comes the latest remedy, and I use the word with my habitual caution, for to me, the experimental state is still in being, in this instance. A French physician has put into extensive practice a method which so far has been the most successful, and more power to his remarkable elbow. He has devised a pressurized cabin in which he can reproduce the atmospheric conditions met with at, say, 11,000 ft., and his results have been gratifying to a large number of children, and parents. No expensive, and maybe rough, flights; just a cabin on the ground.

What of Housing?

Housing was a priority; now it is an also-ran in the economic stakes and the same Minister continues in office. How should we view this changing point of policy? It is a difficult question to answer because there are so many unknowns of which we are unaware, but we can at least spare a moment to examine the position.

There will be a temporary set-back for all branches of the Gas Industry for the simple reason that a lot of municipal building, to which we contributed a small share, will cease. Only essential building will be permitted—*i.e.*, houses for coalminers and agricultural workers. I nearly forgot the amount of work going on at our seaside resorts. There is plenty of money to be made by bricklayers at our holiday haunts; and by plasterers and painters.

GAS SERVICE POCKET BOOK, 1948

We are glad to announce that the 1948 edition of the Gas Service Pocket Book, now off the press, is being dispatched to subscribers and will thus be available from the start of the New Year

If we lose some of our municipal markets it really means that the ordinary consumer can now get a peek in, because more appliances should be available for those who have waited so long for that new cooker or refrigerator. But all gas undertakings should continue sedulously to woo council officials so as to keep a measure of goodwill alive; and the same undertakings should keep their staffs fully conversant with developments in the heating and ventilation spheres. Complacency belongs to yesterday.

Propaganda

The National Coal Board is still issuing its monthly magazine *Coal*. The front cover of the November issue shows in the background a couple of the vast chimneys of the Battersea power station; in the foreground is a pile of coal looking like a younger brother of the Andes. The story inside says: ". . . . the mountain of coal at Battersea power station is a cheering sight. . . .". Who on earth can be cheered by the glimpse of such a mundane heap? The story goes on: ". . . . but domestic consumption is still causing great anxiety and only continuing voluntary co-operation by the householder will prevent the danger of a winter breakdown." *Coal* projects the responsibility on to the user.

Dirty Coal

Mechanization in many of our mines has outstripped the facilities for washing, grading, and cleaning coals; and the labour for the removal of the extraneous matter is not what it used to be. Thus the word output covers a multitude of sins. The dirtiness has been frequently mentioned in Parliament and in the daily Press by experts, who have pointed out that a large percentage of "coal" is useless. The Chairman of the Scottish Fuel Efficiency Committee earlier this year estimated that 10% of 22 millions tons available at that time in Scotland was rubbish. That same rubbish was uneconomically transported by rail and sold to consumers at the same price as coal. We carbonize about 21 million tons of coal every year and if we get 10% dirt in that total it means that a tremendous quantity of gas has been "lost."

Walter King, Ltd., will close their offices at 4 p.m. on Friday, December 19, on the occasion of their Staff Party

Letters to the Editor

District Heating

DEAR SIR,— You were good enough to report in full, in your issue of Dec.3, the contribution that I made to the Institution of Gas Engineers' meeting on district heating. These remarks were purely personal and did not reflect the official policy of the Ministry. Perhaps you will therefore publish this letter in order that any misapprehension may be corrected.

Yours faithfully,

C. H. NOTON.

2, Vine Road,
East Molesey, Surrey.
Dec. 11, 1947.

A " Suspicion " of Heat

DEAR SIR,—With reference to the first paragraph of the " Topping Up " section of your admirable leader on District Heating last week, I can confirm from personal experience that confusion exists. In the recent cold spell my wife joined the queue with a large old-fashioned tureen, only to be informed by the Minister's representative that an ordinary " soup can " was *de rigueur*.

Yours faithfully,

Dec. 12, 1947. " DIOGENES."

(The Editor, though harbouring a *soupçon* of doubt as to his correspondent's *bona fides*, nevertheless publishes the comment in defence of truth and the printers' readers.)

Science Museum Gas Gallery

DEAR SIR,—You will recall that, prior to the recent war, a fund was raised by all sections of the Gas Industry to provide at the Science Museum, South Kensington, a Gas Gallery depicting the historical and technical development of the manufacture, distribution, and utilization of gas, coke, and by-products. Detailed plans for the gallery had been made, but the scheme had to be deferred until the cessation of hostilities.

Despite the frustration and difficulties of the day, the project has now been resumed with a view to its early completion, to which end the plans are being reviewed having regard to the considerably reduced purchasing power of the money available. Four of the dioramas —now displayed at Gas Industry House—and some of the models have already been made.

Substantial economies can be effected by securing, for inclusion in the gallery, the gift or loan of existing models of technical or historical interest, which illustrate " milestones " in the development of the supply of gas, coke, and by-products for domestic, industrial, and commercial purposes. Alternatively, such models could be loaned for copying, thus avoiding the considerable cost involved in devising and designing models, which expense is frequently greater than the cost of their construction.

The representative committee charged with the carrying out of the scheme would be glad, therefore, to receive particulars of models (or other suitable exhibits) which the owners would be prepared kindly to give or loan for purposes of the gallery. It is known that there is a large number of excellent models and exhibits in existence and a selection of these would be made comprehensively to portray, within the space and resources available, the development of the Industry. Consideration of such particulars would be facilitated if accompanied by any photographs available, together with information as to the scale and dimensions.

Yours faithfully,

J. R. W. ALEXANDER,
Hon. Secretary,
Science Museum Gas Gallery Committee.

1, Grosvenor Place, S.W.1.
Dec. 8, 1947.

Personal

Mr. F. C. BOULTER, of Cochran & Co. (Annan), Ltd., has just left Britain on a 20,000 mile flight to Africa and the Far East, carrying with him a boiler suit in which he can demonstrate as well as sell boilers of types which he has already supplied to many different countries.

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Among those attending the investiture held by the King at Buckingham Palace on Dec. 16 was Lieut.-Colonel HUGH WOOD, who received the D.S.O. Colonel Wood saw service in many theatres of operations with the 50th Div. Engineers and 30th Corps Troops Engineers, was awarded the Croix de Guerre in 1944. Since returning from the Forces Colonel Wood has been appointed C.R.E. of the 103rd Field Engineer Regiment, which is the old Territorial Army 50th Divisional Engineers. In civil life Colonel Wood is Assistant Managing Director of Hugh Wood & Co., Ltd.

As from Jan. 1, 1948, Mr. DEAN CHANDLER retires from his long and distinguished service with the South Metropolitan Gas Company. It was in January, 1900, that, under Mr. A. F. Browne, Mr. Chandler entered the Company at their Vauxhall Works, where he gained a general knowledge of gas-works practice. Seven years later he was transferred to Old Kent Road, where he worked under the direction of Dr. Charles Carpenter, who was at that time Chief Engineer to the Company. After a short period in the drawing office he was instructed to carry out a detailed investigation of the working of the Old Kent Road Works producer system, and the retort bench efficiency. As a result of the investigation, which took about 12 months to complete, a number of improvements were made, notable among them being the more effective insulation of the settings and the introduction of the Chandler coke chute. The addition of the latter to the retort house machinery considerably reduced the production of breeze in the house, and he was awarded special recognition for the invention by the Board of Directors.

In 1910 Mr. Chandler was deputed to put into practical operation Dr. Carpenter's ideas for the simplification and standardization of gas fittings and domestic lighting and heating appliances. A physical laboratory was provided where testing and experimental work could be carried out. Within a year or two " Metro " fittings and apparatuses were available on the district. It was strictly laid down by Dr. Carpenter that all " Metro " appliances should be provided with gas burners containing no mechanical " gadgets " which could be manipulated by the consumer, and any kind of operable regulating device was forbidden. All component parts were to be interchangeable, and to achieve this an elaborate system of limit gauging was established.

On the outbreak of the first World War in 1914 Mr. Chandler was deputed by Dr. Carpenter to deal with the many problems which quickly arose in regard to the industrial uses of gas in South London, and, on the formation of the Industrial Gas Centres, he was called upon to take charge of the South Metropolitan Centre.

In 1932, again on the instructions of Dr. Carpenter, he collaborated with the late Dr. Bernard Friedman in adapting the Junker gas water heater to the practical requirements of South London. Investigations were made at the Dessau Laboratories, where the necessary modifications put forward by Mr. Chandler were carried out. The first 2,000 machines to be used in this country were ordered by the South Metropolitan Gas Company for a large scale trial, and were known as " Metro " instantaneous water heaters. After their proved success in South London the name " Ascot " was suggested by Dr. Friedman and agreed to by the Company.

Between the two wars Mr. Chandler was closely associated with the production of improvements in public lighting, and he compiled a *History of Lighting by Gas*, published by Walter King, Ltd.

In recent years Mr. Chandler has been responsible for the development and application of the neat gas principle. He intends to continue to serve the Industry, and is particularly interested in the work of the Gas Gallery project for the Science Museum at South Kensington. He is Chairman of the Executive Committee set up in 1939 to carry out the scheme.

Obituary

For 20 years Engineer and Manager of the Kirkby Lonsdale (Westmorland) Gas Company and later for three years Manager of the gas-works at Ingleton until his retirement, Mr. WALTER COOKE, a native of Bradford, has died at Ingleton at the age of 71.

* * *

Manager and Secretary of the Cupar Gas Company for 52 years, Mr. JAMES MACPHERSON has died at his home, Strawberry Bank, Cupar, at the age of 76. After attending University College, Dundee, he began his career at Kirkcaldy, assisting his uncle, who was Gas Manager there. Mr. MacPherson retired two years ago and was succeeded by his son, Mr. A. M'Gill MacPherson.

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Mr. JOSIAH LANE, Sandhills House, Brownhills, Birmingham, well known in the tar distilling industry, has died at the age of 57. With his brother, the late Mr. Reginald Lane, he began work 40 years ago at the Brownhills Chemical Works, which was later merged with Midland Tar Distillers, of which he became a Director. He was Chairman of seven tar distilling companies, Technical Director of Lancashire Tar Distillers, Ltd., a Director of three other large industrial concerns.

* * *

The death occurred on Dec. 10 of Sir WILLIAM J. TALBOT at his home, Highcroft, Birmingham Road, Walsall, aged 75. He was Chairman of Talbot-Stead Tube Co., Walsall, and of Chesterfield Tube Co., Ltd., in the Tube Investments Group. He received his knighthood in 1935 for political and public services in Walsall. Sir William was educated in Birmingham at the George Dixon School and at Mason College, and received training as an engineer with Bellis and Morcom, Ltd., after which he was awarded a Whitworth Exhibition. He became Works Manager at the Perfecta Tube Co., Birmingham, afterwards at John Russell & Co., Ltd., Walsall, and started the Talbot-Stead Tube Company in 1906. Sir William was a member of the Iron and Steel Institute and of the Institute of Metals.

News in Brief

Smethwick Town Council has decided to promote a Bill in Parliament empowering the Corporation to construct gas-works at Alexandra Road, Handsworth.

Market Harborough Gas Committee has completed the installation of a new screening plant at the gas-works and the plant was formally opened on Dec. 8 by the Chairman of the Committee; Councillor C. W. Cooke.

The Last Serious Onslaught on Blackpool's 6,000 gas lamps by mischevious boys was 18 months ago, Mr. T. R. Cook, Engineer and Manager of the Gas Department, now reports that a special appeal to children in the schools has worked wonders.

The Northern Divisional Coal Board has announced that it will meet representatives of the Durham Cokemen's Union to discuss cokemen's wages and conditions as soon as strike notices issued by the men are withdrawn. The notices have not the backing of the official unions.

Copies of the recently issued British Standard Specification B.S. 1401/3 : 1947, Copper and brass tubes for gas installation work and gas lighting fittings, price 2s. net (post free), can be obtained on application to the Secretary, the Institution of Gas Engineers, 1, Grosvenor Place, London, S.W.1.

Briggs (Lincs) Urban District Council has approved a suggestion that there should be a local branch of the Women's Gas Council for the town and district. Mr. C. E. Smith, Engineer and Manager of the Gas Department, has been instructed to go ahead with the scheme. The Council has given permission for meetings and lectures to be held in the Council Chamber.

Trade Statistics for September just issued by the Department of Industry and Commerce in Eire show imports of 17,344 tons of gas coal valued at £48,476, as against 23,255 tons valued at £68,700 in September, 1946. This brings the total of these imports for the first nine months of 1947 to 90,447 tons, valued at £301,907, as against 194,553 tons, valued at £568,270, in the corresponding period of 1946.

A Course of Six Lectures on "Modern Applications of High Temperature Alloys" will be given by Mr. C. G. Conway, B.Sc., at the Sir John Cass Technical Institute, Jewry Street, Aldgate, E.C.3, commencing on Jan. 22. The lectures will be given on Thursday evenings at 6.15 p.m., and the fee for the course is 10s. Application for enrolment should be made to the Principal prior to the opening date if possible.

The Yorkshire Regional Offices of the following organizations have been transferred from 7, Park Square, Leeds, to Guildford Chambers, 111, The Headrow, Leeds, 1: British Gas Council, Yorkshire (West Riding) District; Federation of Gas Employers, Yorkshire (West Riding) District; Regional Joint Industrial Council for the Gas Industry (Employers' Section); Yorkshire Gas Coke Association; Yorkshire Commercial Section of the Manchester District Association of Gas Engineers; and Gas Coke Directorate, Ministry of Fuel and Power. The telephone number (Leeds 25691) remains unchanged.

Seventy-one Students from the Sheffield and District Gas Company have enrolled this year for gas fitting and supply classes, 43 having registered for gas fitting, 18 for gas engineering supply, and 19 of the younger students are attending district evening schools. These figures were given when 50 members of the distribution staff met to receive examination certificates obtained after the previous evening school session. Of the nine students who sat for the City and Guilds examinations, seven obtained first-class passes and two obtained second-class passes. In the College sessional examinations 23 students sat for the Senior First Year examination, while 14 took the Senior Second Year, and every student was successful. In the absence of Mr. Ralph Halkett, General Manager, the meeting was presided over by Mr. A. Wylie, Sales and Fittings Superintendent, supported by Mr. Hall, Principal of the Sheffield Technical College, and Mr. Whaley, Assistant Head of the Sheffield College of Commerce and Technology. The certificates were presented by Mr. W. T. Hird, Distribution Superintendent of the Company.

Diary

Dec. 22.—London and Counties Coke Association: Finance Committee, 11 a.m.; Executive Committee, 11.30 a.m.; Central Committee, 1.30 p.m.

Jan. 12—Women's Gas Council: Executive Committee, Gas Industry House, 1 p.m.

Jan. 20.—National Federation of Gas Coke Associations: National Technical Committee, Gas Industry House, 11 a.m.

Jan. 20.—Solid Smokeless Fuels Federation: Technical Committee, Gas Industry House, 2.45 p.m.

NEW STEWART AND LLOYDS FILMS

Two admirable films dealing with the manufacture and application of the tubular products of Stewarts and Lloyds, Ltd., have been made by the Company and rank as fine examples of the educational industrial film.

The films have been produced by Mr. Frank Green and directed by Mr. John Miller of Ace Distributors, Ltd. The commentaries, by Mr. Douglas Dale, are spoken by Mr. Frank Phillips, of B.B.C. fame. Each film runs for approximately half an hour and has a musical background and non-technical commentary.

In "Thro' the Mill," the sequences covering the production of iron and steel, the continuous-weld, and push-bench tubemaking processes were shot at Corby, while those dealing with the Pilger Mill and the hydraulic lap-weld process were taken at two of the Company's Scottish works, Calder and British.

The opening sequences of "Thro' the Mill" deal with the essential preliminaries to tube manufacture—the production of iron and steel. Without going deeply into technical details, the film moves rapidly through the many stages involved between the blasting and excavation of the iron ore to the final casting of the steel ingot. There are some effective shots in this first section taken at Corby of coke ovens, the charging and tapping of blast furnaces, and the Bessemer converters in operation. The film then concentrates on the various processes by which steel tubes are manufactured.

First, the production and coiling of steel strip used for the making of welded tubes by the continuous-weld process. Pictorial highlights of this section are the strip emerging from the furnace and entering the forming rolls, the flying saw in operation and the lengths of tube moving across the cooling racks.

The manufacture of seamless tubes by the push-bench process which follows is equally interesting.

Before turning to the production of seamless tubes by the Pilger process at the Calder works in Scotland, the film touches on various operations. These include pickling, galvanizing, screw-threading, socketing, hydraulic pressure tests, welding tests and tensile tests, and show the care taken to ensure that only high quality tubes leave the Company's works.

The sequence on the Pilger process is instructive and the sound effects are realistic.

This is followed by the hydraulic lapweld process, filmed at Stewarts and Lloyds' British Works near Coatbridge.

In a 30 minute survey it is impossible to cover every tube making process, but "Thro' the Mill" gives a comprehensive impression of steel tube making in Stewarts and Lloyds' works.

Within the space of 35 minutes, "The Tube Age" gives an impressive picture of the world-wide contribution made by S. & L. products to industry, agriculture, public works, municipalities, railways, shipping, and in many other spheres. The requirements of many and varied industries are dealt with in turn. From the coal mines of Wales to the china clay pits of the west of England; from factories in being to factories in the making; from large power stations to simple domestic installations; from pre-fabs. to permanent housing estates. Also included are shots from the Middle East of pipelines, refineries, distillation and cracking plants, and of the oil ports and storage depots in Great Britain. Other shots show the large quantity of tubes required for many purposes in modern ships, and particular reference is made here to refrigeration. On the practical side, the laying of a 36 in. water main provides an effective and instructive sequence.

The static nature of the product called for a high standard of photography and editing, and by rapid camera movement and first class lighting, interest is effectively sustained.

Both films are available for either 35 mm. or 16 mm. projectors, and are obtainable from Stewarts & Lloyds, Ltd., Publicity and Publications Department, Brook House, W.1; they are already being widely exhibited in Holland, Denmark, and Scandinavia, and special Spanish and Portuguese translations have been prepared for South American distribution.

ANOTHER RISE IN COAL PRICES

The National Coal Board announced yesterday (Dec. 16) a further increase of 2s. 6d. per ton in the pithead price of all qualities of deep-mined coal (excluding slurry) supplied for inland consumption and as coastwise bunkers as from Jan. 1. The increase makes a total average increase of 26s. a ton since 1939. Mr. J. R. W. Alexander, General Manager of the British Gas Council, commenting on the increase, said: "It must sooner or later be reflected in the price of gas. Current increases in gas prices have covered only recent rises in the cost of coal, freight and gas oil. Other increased costs in labour and materials have been borne by undertakings, but many will have to take such increases into account when dealing with the further rise in the price of coal, which alone represents an increase of about ½d. a therm."

NORTH OF ENGLAND AUXILIARY

The Forty-ninth Half-yearly Meeting of the Auxiliary Section of the North of England Gas Managers' Association was held in the Burlison Art Gallery, Durham, on Dec. 5. Mr. Bernard Richardson (Newcastle-upon-Tyne and Gateshead Gas Company) was in the chair. The members were welcomed by Alderman Goodyear, and Mr. W. O. Kirkwood (Sunderland) replied on behalf of those present.

A Paper entitled "The Influence of Packing Density in Purifiers on Resistance to Gas Flow" was read by Mr. J. A. Speers, Chief Chemist, Middlesbrough Gas Department. An abstract of the Paper is given in this issue of the "JOURNAL." A vote of thanks to the Author was proposed by Mr. G. Shortland (Sunderland) and seconded by Mr. S. A. Tait (Stanley).

After the meeting, tea was provided by the City of Durham Gas Company, and Mr. D. Yule (South Shields), on behalf of the members, expressed thanks for the hospitality provided.

WOMEN AND HOME WEEK AT BEDFORD

A week of special demonstrations, lectures, and competitions of special interest to women has just been completed at Bedford. Under the title of Women and Home Week, the effort was widely advertised by the Bedford District Gas Company and record audiences were reported. At the demonstration of icing and decorating Christmas cakes, given by the Gas Company's own Demonstrator, Miss Margery Davis, M.C.A., the demonstration theatre was packed to capacity, including standing room, and many people were unable to get in. Excellent attendances were also reported for a lecture and demonstration on "How to be Beautiful" given by representatives from Elizabeth Arden, Ltd., "Decorating Your Home" by Mr. H. S. Manning, F.R.S.A., F.I.B.D., and "Things to Make and Do" by Miss J. Dobbyn, Domestic Science Organizer for Bedfordshire.

The culminating feature of the week was a brilliant Brains Trust on the subject "Children and Home" in which the Assistant Director for Further Education for Bedfordshire, as Question Master, was supported by the Archdeacon of Bedford, a doctor, the Matron of Dr. Barnardo's Home, a woman J.P., the headmaster of a very progressive school, and an expert on home decoration. The discussion was on a high level and very entertaining.

At the end, prizes were presented by Mrs. White, J.P., to winners in the competitions for bottled fruit, knitting, handwork, biscuits, and decorated cake, which had been held during the week.

Parties of school children had been given special sessions in the morning on suitable subjects, a film show being substituted for the Brains Trust.

CONSTANT GAS PRESSURE FOR LIVERPOOL

On Dec. 4, Mr. C. H. Leach, General Manager and Secretary of the Liverpool Gas Company, opened a valve at the Wavertree Works which created the final link in the scheme first started four years ago to ensure that all the consumers in the area of the Company will be supplied with gas at adequate and constant pressures through specially designed regulators. This final link brought into the whole scheme consumers in the Edge Lane, Old Swan, Tuebrook, and Anfield areas, which carry a heavy industrial load. The low pressure system of distribution has now been converted to carry gas at intermediate high pressures, and at various points in the 102 square miles area of supply governors are placed where gas pressure is reduced for use in appliances

Mr. C. H. Leach, General Manager and Secretary of the Liverpool Gas Company, opening the valve at the Wavertree Works. With him are Mr. W. S. Hubbard, Engineer, and Mr. F. Bell, Distribution Engineer.

W.G.C. OPENS AT HULL

The inaugural meeting of the Hull and District Branch of the Women's Gas Council was held on Nov. 24 in the Demonstration Room of the East Hull Gas Company. Mrs. T. W. Brown was in the Chair, and the meeting was attended by the Lady Mayoress of Hull, Mrs. T. W. Broadbent, who agreed to be President of the Branch.

A welcome to the Lady Mayoress and Miss D. W. Pidsley (Assistant Organizing Secretary of the Women's Gas Council, London) was extended by Mr. T. W. T. Hammerton, Manager and Secretary of the East Hull Gas Company, on behalf of the Chairman and Directors of the Company, who spoke of the useful public service the Branch could give, especially at the present time, in the way of real economy of fuel.

Miss Pidsley spoke of the organization of the Women's Gas Council, and gave details of its aims and objects. The Branch was then officially inaugurated by the Lady Mayoress, who was introduced by Mrs. T. W. Brown, the Chairman of the Hull and District Branch of the Women's Gas Council.

Among representatives of organizations were Mrs. F. S. Simpson (Citizens' Advice Bureau), Mrs. Fratson (President of Hopewell Road Townswomen's Guild), Mrs. D. E. Launder (National Council of Women), and representatives from the Soromptomist Club, W.V.S., Girl Guides Association, and British Legion Women's Section.

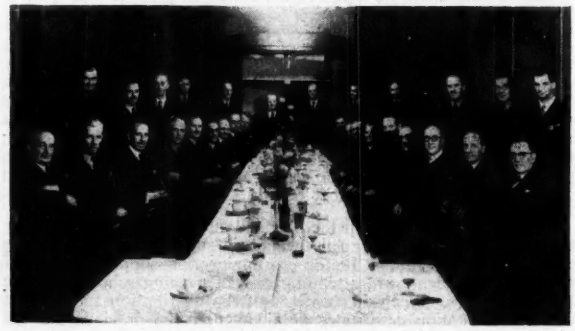
The programme for the session includes a New Year party, a talk on beauty culture, cookery and home laundry demonstration, a talk and films by the City Police Safety Officer, and Gas Industry and National Coal Board films.

Mr. J. G. Tilley, Engineer and Assistant Manager of the East Hull Gas Company, proposed and Mrs. F. S. Simpson seconded a vote of thanks to the Lady Mayoress. A representative committee has been formed and a lively interest is being shown in the work of the Branch.

FRIENDLY ENEMIES

A sign of the times was witnessed at a congenial gathering of sales executives of competitive gas appliance manufacturers who gathered at Eastbourne recently to honour the retirement of Mr. Leonard Wise after 46 years of continued service with the Eastbourne Gas Company.

The Chairman of the gathering, Mr. W. O. Shildrick (R. & A. Main, Ltd.), made a presentation to the guest of honour of a case of pipes and tobacco tankard inscribed "From his many pals on the road."



The party at the Gildredge Hotel, Eastbourne, comprised Messrs. C. J. B. Sawbridge, S. W. Hammond, and H. Simmonds (Eastbourne Gas Company), W. O. Shildrick, W. J. Shildrick, and H. F. Potter (R. & A. Main, Ltd), F. Blake (Davis Gas Stove Co.), J. S. Burgoyne (W. & B. Cowan), Keith Carey (Willey & Co., Ltd.), H. A. Catton (Richmonds Gas Stove Co., Ltd. (Radiation)), W. H. Cottrell (Ewart & Sons, Ltd.), S. Crowle (Thos. Glover & Co., Ltd.), L. E. Dougall (A. G. Sutherland, Ltd.), H. Friedman (late of Friedman, Athill, Ltd.), W. Garland (Staveley Coal and Iron Co., Ltd.), R. W. Hammond (Sutherland Meter Co., Ltd.), A. P. Kelsey (Falk Stadelmann & Co., Ltd.), L. F. King (Fletcher Russell & Co., Ltd.), R. H. Lewes (Bratt Colbran, Ltd.), F. J. Patching (W. M. Still & Sons, Ltd.), F. G. Rogers (Arden, Hill & Co., Ltd. (Radiation)), W. J. Rowett (Donald Macpherson & Co., Ltd.), H. C. Shadbolt (Cannon Iron Foundries, Ltd.), H. A. Whyatt (Wellington Tubes, Ltd), H. Williamson (Evered & Co., Ltd.), W. H. Willis (Arden, Hill & Co., Ltd. (Radiation)), F. C. Wilson (Geo. Wilson Gas Meters, Ltd.), A. R. Winmill (Phoenix Supply Co.), R. Boorn (Cowper Penfold, Ltd.), E. Andrew (R. & A. Main, Ltd.), F. C. Bedlow (Drakes, Ltd.), A. Cuffley (Richmonds Gas Stove Co., Ltd. (Radiation)), J. M. Backhurst (Ascot Gas Water Heaters, Ltd).

An extremely good time was enjoyed by all, and a cordial welcome was extended to the sales executives' guests—Mr. C. J. B. Sawbridge (General Manager), Mr. S. W. Hammond (Engineer), and Mr H. Simmonds (District Manager), of the Eastbourne Gas Company.

HEAVY DUTY PIPES AND FITTINGS

Cannon Iron Foundries, Ltd., inform us of a new service to the Gas Industry in the form of "Canalloy" heavy duty pipes and fittings for gas appliances. This extension of the application of "Canalloy"—first used for actual appliance components—is logical and not entirely unexpected. Shortages in orthodox production metals and the necessity for making things easier for over-worked fitters fully justify—indeed, are the cause of—this development. It is believed that this is the first large-scale production plan in the British Gas Industry for light alloy pipes and fittings.

"Canalloy" tubing, bends, unions, cocks, &c., can be specified for all runs up to ½ in. B.S.P. Tubes are solid drawn and withstand great pressure. The metal is light in weight, which makes for easier handling, and, being self-coloured, takes on a most attractive bright polished finish without the necessity for plating. Tube can readily be cut, bent, screwed, and tapped on the job with ordinary fitter's tools and dies. The metal offers great resistance to corrosion, and it is claimed that with the use of "Canalloy" jointing compound, electrolytic corrosion is eliminated.

HAIRDRESSERS IN THE MAKING

Gas plays a very big part in all the special Government training schemes for those discharged from the Forces. Our photograph depicts a special section equipped with a battery of 10 Ascot hairdressers' water heaters for shampooing and all hairdressing purposes at the Ministry of Labour Trades Training Centre, Luton. Trainees desirous of entering the hairdressing profession will soon be receiving a full course supervised by experts who have shown their preference for the special Ascot water heater expressly designed for this purpose.

SCOTLAND'S ENGINEERING CENTRE

Leading firms on the contracting and appliance manufacturing sides of the Gas Industry are represented in the Engineering Centre, which opened in Glasgow on Dec. 3. Sir James Lithgow, Bart., of Lithgows, Ltd., performed the official opening before a large audience of industrialists, engineers, and technicians. The new centre has the support of the Institution of Gas Engineers, as well as of some 40 other technical and professional bodies. The idea behind the scheme is that of providing a permanent centre where engineers, suppliers, machinery builders, raw material, and component firms can exhibit and meet prospective customers in the heart of Glasgow. Two floors have been completed, the ground floor covering hydraulic and mechanical engineering and the first, precision and measuring instruments, non-ferrous materials, bearings, precision castings, accessories, and the smallware of the Industry. The second floor, opening late in January, will be used for electrical equipment, and the basement, also due to open then, for boilers, stokers, insulation, power equipment, heavy engineering and coal handling plant. The majority of the present stands are attractively displayed and promise a permanent value to industrialists seeking equipment.

Among the equipment is a display by the Balfour group, showing a variety of models including a spirally guided gasholder, a static washer, water tube condenser unit, and purifier box unit. Other Gas Industry exhibits include Prior Stokers, Ltd. (automatic stokers); Incandescent Heat Co., Ltd. (furnaces and equipment); Matthew Hall & Co., Ltd. (infra-red gas heating system); De la Rue Gas Development Co, Ltd. (gas boiler); Richard Crittall & Co., Ltd. (heating and ventilating equipment); Babcock and Wilcox, Ltd. (boiler and coal handling plant); Ascot Gas Water Heaters, Ltd. (water heaters); as well as a large variety of related equipment essential to the successful operation of gas-works.

"PUBLICITY PARADE" A BIG ATTRACTION

The British Gas Council's Publicity Exhibition, described in our issue of Dec. 3, is attracting many visitors to Gas Industry House. Following the Press pre-view, which was attended by more than 100, there has been a steady stream of callers from all parts of the country and overseas. Particular interest has been shown by Government Departments and special visits from the following Ministries have been made: Fuel and Power, Supply, Food, Admiralty, Air, Board of Trade, War Office, National Coal Board.

Parties from large industrial and commercial concerns include the publicity staff of J. Lyons & Co., Ltd., and representatives from the Milk Marketing Board, British Overseas Airways Corporation, General Post Office, and Imperial Chemical Industries. The London Press Club, which has 1,500 members, has also paid a special visit and similar arrangements are being made for other organizations.

Representatives of many gas undertakings have visited Gas Industry House from all parts of the country and much favourable comment has been expressed concerning the practical value of this presentation of the publicity services of the Industry.

£3,000,000 PLANT FOR BIRMINGHAM

Despite the cuts to be made in capital expenditure, the Birmingham Gas Department has received authority from the Minister of Fuel and Power to proceed with its schemes for extensions to the Nechells plant at an estimated cost of £1,000,000 and extensions at Swan for Village at a cost of £2,000,000.

Contracts have been placed for the work, but it is expected that the Nechells scheme will not be completed for more than a year and the Swan Village scheme for more than three years. The proposals received the approval of the City Council in July.

A further scheme has been prepared for new plant to be erected on land, already in possession of the Gas Department, at Washwood Heath. This project, however, had not yet been approved by the Gas Committee.

It has been prepared to meet a position already foreseen, that when the Nechells and Swan Village schemes are in full production the output of gas at that time will be absorbed and there will be need for further plant.

Mr. Alex W. Lee, General Manager, has stated that the coal stock is considerable—probably 100,000 tons, or four weeks' carbonizing capacity, and about 6,000 tons more than at the corresponding time last year. Present plant, however, is inadequate to meet the unprecedented demand. At this time last year about 75,000,000 cu.ft. of gas a day were consumed. The recent cold weather sent up the figure to 88,000,000 cu.ft.

INDUSTRIAL CO-PARTNERSHIP ASSOCIATION

Describing himself as representing a dying industry, but one which had for many years successfully employed co-partnership methods, Mr. E. C. Woodall, Chairman of the Tottenham and District Gas Company, took the chair on the occasion of a lunchtime meeting of the Industrial Co-Partnership Association in the Assembly Hall of the Royal Empire Society, W.C.2, on Dec. 4.

An address was given by Mr. D. Heathcoat Amory, M.P., Director of John Heathcoat & Co., textile manufacturers, Tiverton, who is a member of the Executive Committee of the Association.

Man's motives for working, said Mr. Heathcoat Amory, might be listed as fear of starvation, financial gain, loyalty to the individual or the group, and satisfaction in doing a job well. All these motives were now less than they had been: fuller employment and improved social services had dissipated much of men's fear; taxation had cut down their chances of growing rich; the disappearance of the personal element in industry had resulted in a reduced feeling of responsibility on the part of the workpeople; and the growth of the automatic machine had done much to eliminate pride in workmanship. The development of new interests and hopes described by Mr. Heathcoat Amory might be summarized as: (i) As much security in employment as the job can give, including a contract of service binding both employer and employee; (ii) open opportunity for direct rewards for energy and skill by some sort of "payment by results" system and careful upgrading and promotion; (iii) decentralization and the provision of a two-way channel of information, up and down, so that questions may be asked and grievances made known; and (iv) giving every employee a share in the financial results.

The meeting concluded with a lively discussion.

Other representatives of the Gas Industry present were Mr. R. H. Epps, Secretary of the Tottenham and District Gas Company, Mr. C. M. Hemsley, Secretary of the East Surrey Gas Company, Mr. S. Hooker and Mr. Thorn, South Suburban Gas Company, Mr. A. S. Holden, South Metropolitan Gas Company, Mr. R. J. McCrea, Secretary of the Wandsworth and District Gas Company, and Mr. C. W. A. Smith, North Middlesex Gas Company.

THE JUNIORS VISIT THE MANUFACTURERS

A feature—and by no means an unimportant one—of the activities of the British Junior Gas Associations comprises visits to the works of manufacturers of gas-making plant and gas-using appliances. Such visits are made possible by the cordial relationship which has for long existed between the supply side of the Gas Industry and what has come to be termed the manufacturing side. On these visits it becomes possible to understand one another's point of view and to appreciate each others problems—always with the aim of finding a satisfactory solution in what, after all, is a common purpose. On these two pages we glimpse, largely through exclusive photographs, a few of these informatory "tours of inspection" recently made.

Mr. H. J. Patching (Peterborough), Vice-President of the Eastern Junior Gas Association, Mr. J. S. Marshall (Lincoln), President, and Mr. W. G. Dewar, Works Manager o, the Shredded Wheat Co., Ltd.

Food and Radio

To Welwyn Garden City on Nov. 19, at the invitation of the Watford and St. Albans Gas Company, went many members of the Eastern Junior Gas Association, led by their President, Mr. J. S. Marshall, of Lincoln. Their purpose was to inspect the factories of Shredded Wheat, Ltd., and Murphy Radio, Ltd., in both of which gas is used extensively. After lunch, at which they were formally welcomed by Mr. T. C. Battersby, Director, General Manager, and Chief Engineer of the Watford and St. Albans Gas Company, the visitors proceeded to the home of shredded wheat, a triumph of cleanliness and mechanization. In the new extension baking is carried out in three 8,000 cu.ft. per hour ovens, the "loaves" entering at the bottom, passing backwards and forwards, and emerging at the top. Serviced by an 8 in. main, the meter registers some 25,000 cu.ft. hourly; annual consumption (1946) was 32 million.

At the factory of Murphy Radio, Ltd., uses for gas include soldering, plating, bonderizing, stoving and drying, while gas is the chosen fuel for space heating and canteen cooking. The 21 meters register from 100 to 3,000 cu.ft. per hour, and the consumption last year was 19 million cu.ft.

With the Bryan Donkin Company

A popular meeting of the Manchester District Junior Gas Association took place on Nov. 12, when a large number of members visited the Works of the Bryan Donkin Company, Ltd., Chesterfield. After lunch, provided by invitation of the Company, and a welcome from Alderman G. Clark, J.P., Chairman and Managing Director, the inspection of the Works commenced.

The smith's shop was the first department to be inspected, where component parts for various types of valves could be seen being shaped prior to assembly. Moving on to the foundry, the visitors had the opportunity of seeing cores being made and dried in the most up-to-date hot air ovens. In the brass foundry an extensive range of valves and valve seats in brass and gunmetal were inspected, and here also the visitors were able to see governor bodies being die-cast in aluminium alloy. In the pattern shop members saw various patterns for large governors, and also for cylinder heads for vertical reciprocating compressors.

In the machine-shop members saw precision lathes working to fine limits in the machining of piston rods for compressors, and the machining of governor and valve bodies. In the governor shop a range of governors on test was one of the high lights of this department. Among the various types on view were a retort house governor of the diaphragm type, with relay control, and also a volumetric governor designed to feed a district from a gasholder. Another interesting exhibit which created much attention was the Hanson-Donkin "Autopilot" governor. The well-known Reynolds type governors were also inspected under test, and a range of smaller governors, including a gas meter governor which is now being used on the gas supply of prefabricated houses. Proceeding to the valve assembly shop, the parties were able to see a number of larger valves being assembled, ranging in size up to 60 in. diameter, for use in the gas and coke industries, and also for the chemical industry, in this country and overseas.

The visitors were fortunate in being able to see a two-crank single-stage compressor actually working under test, which was capable of dealing with the 150,000 cu.ft. of gas per hour.

The shops of the Associated Company, British Furnaces, Ltd., was also visited, where a number of gas-fired furnaces were on view.

A group of Eastern Juniors at the Factory of Murphy Radio, Ltd.

Mr. F. Bell (President of the Association), in moving a vote of thanks to Alderman Clark, said the Manchester Juniors were always keen to study distribution equipment, and they knew from experience that Bryan Donkin equipment was first-class equipment. In Liverpool they had over 100 district governors, from 4 in. to 24 in., dealing with 25 to 30 million cu.ft. of gas per day, and they were all made at Chesterfield. Mr. Bell, on behalf of the members, expressed thanks for the care and attention given to the arrangements which had made their visit such a success.

Mr. R. J. Bradshaw (Junior Vice-President of the Association), seconding the vote, said it was the first time he had visited the Works of the Bryan Donkin Company, and he had been impressed by the precision work carried out.

The Vice-President of the London and Southern Junior Gas Association, Mr. L. J. Clark, proposing a Vote of Thanks to the Sigma Company and to Mr. J. Loxham, a Director of the Company, who is seated at his right.

Gas Appliances and Meters

London and Southern Juniors paid a visit on Dec. 4 to the 23 acre Gothic Works of Glover & Main, Ltd., at Edmonton. In the morning they toured the works of Thomas Glover & Co., Ltd., the original makers of dry gas meters. The manufacture of gas meters was shown, starting from the raw materials through the many combining stages to the finished product. In the meter testing section members noted the extreme care taken to assure that every meter that left the factory was as perfect as skilled workmanship and fine materials would allow.

The guests were welcomed at lunch by Colonel W. R. Glover, C.M.G., D.S.O., and Mr. C. A. Deas, President, in response, thanked the Directors for their warm welcome.

After lunch the visitors were conducted round the workshops of R. & A. Main, Ltd.—pioneers of the all-enamelled gas cooker—where they were shown the core, moulding, press, enamelling, and fitting shops. Of special interest were the mechanized core and moulding shops. In the former they saw how thousands of small cores are made and moved on a 140 ft. overhead conveyor to the loading side of a vertical, continuous core oven heated by town gas.

Tea was provided in the works canteen following which a vote of thanks was proposed by Mr. Deas to the Chairman and Directors of the Company. Mr. C. Marley, Director, suitably replied.

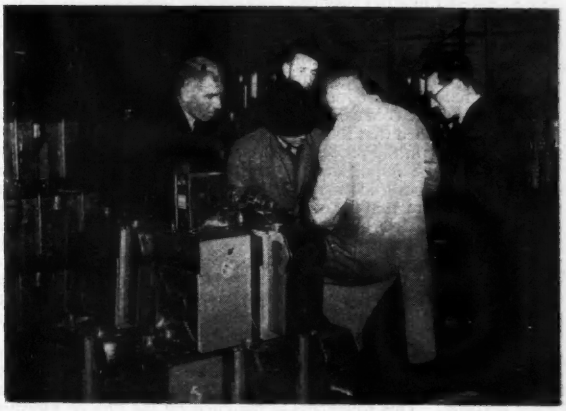
Precision Instruments

A notable visit was paid by the London and Southern Junior Gas Association to Letchworth on Nov. 5 and 6, to inspect the works of the Sigma Instrument Company, the eighty visitors being divided into two groups. They were welcomed by Mr. John Loxham, Managing Director, and, divided into small parties, were conducted round the works by capable guides.

An interesting innovation in the Company's range of recordings indicating calorimeters was a device for bringing together the results recorded on different instruments throughout the works and re-recording these results on a multi-point recorder or, if necessary, on several multi-point recorders, all mounted on a common panel.

Examples of automatic control equipment were of three types. Two of these devices were electrical, one being intended to operate an on/off system for supplying steam to a producer in accordance with the requirements of the gas being produced in the retort house. A second electric system was one which operated a butterfly valve in the producer gas stream, and so controlled the rate of mixing producer gas with retort gas to give a mean line at the predetermined calorific value. A third system was operated pneumatically, and depended entirely on gas pressure and the vacuum in the gas system for its operation.

Many fine measuring instruments were also inspected.



London Juniors study prepayment coin attachments at Edmonton

Members of the London and Southern Junior Gas Association with their host, Colonel W. R. Glover, and their President, Mr. C. A. Deas (centre) at Gothic Works, Edmonton.

INFLUENCE OF PACKING DENSITY IN PURIFIERS ON RESISTANCE TO GAS FLOW*

By J. A. SPEERS, M.Sc., M.I.Mech. E., M.Inst.Gas E., M.Inst.F.,

County Borough of Middlesbrough Gas Department

THE material in a box may become " spent " due to either or both of two conditions—loss of activity of the material or increase in resistance to gas flow. In a previous paper† the author has dealt in some detail with the former condition, and the latter appears to be an application of the laws of gas flow through beds of granular solids which have been studied by a number of workers. Several variations occur in a purifier box, however, which remove the treatment from the field of general conditions. These are mainly brought about by the fact that the material is normally fed into the boxes in a moist condition.

Although most materials used for purification are made up of a considerable range of sizes of particles, varying from the size of dust to others of a moderate magnitude, the smaller sizes adhere to the larger ones and in effect produce a number of larger particles causing a more open formation of the material. Before the material has dried out sufficiently to allow the small particles to drop away, a certain amount of sulphur deposition will have occurred which will have bound the particles together in a permanent form, thus leaving the voidage at approximately its original value.

The greater this voidage, the more room there will be for sulphur deposition, provided that there is sufficient quantity of active material present to carry on the process effectively, so that care in the original filling is of prime importance in pressure control, as consolidation at that stage can never afterwards be rectified until the box is emptied. It is clear, therefore, that the method of filling also exerts a considerable influence on the life of the box, and it is hoped to indicate the extent of this influence in this paper.

As the packing material is filled when moist, it will usually have a voidage considerably greater than that which normally exists for the dry material, and it may be expected that the depth of packing and hence the total weight on the lower portion of the layer will cause consolidation which will increase with the depth of the layer.

The resistance to gas flow is also influenced by surface roughness of the particles, and where fine particles of the material adhere to the larger ones, they in effect produce a form of roughness on the larger particles. This roughness is modified by the film of moisture which covers the surface when the material is damp. Considerable variations exist between surface roughness and internal porosity of particles of different materials, and the surface area exposed for moisture absorption varies to a great extent. If we assume a moisture film of molecular thickness penetrating all the pores, it is possible that quite a considerable quantity of water can be held before the film covers the whole surface of very porous material. Further water may be held in the depths of these pores without the material appearing to be damp.

On the other hand, non-porous bodies will quickly become coated with surface moisture. Hence the properties may be expected to vary according to the surface roughness and porosity of the particles of filling material. It is probable that the pores have to be almost completely filled before the particles can offer much in the way of capillary attraction to the other particles.

Preliminary tests carried out on the density of packing of oxide particles showed the following results:

(1) Dry packing fed from a tube without fall showed uniform density throughout the height.

(2) Dry packing dropped from a constant height showed a small fall in density at higher levels.

(3) Curves plotting density against moisture content showed a minimum value similar to the findings of other workers, but a maximum value was obtained at higher moisture contents usually greater than on the dry material.

(4) Material with a moisture content below a critical value gave packing of a uniform density when fed from a tube without falling, but above this critical moisture content some compression occurred at the lower part of the packing. Difficulties were experienced experimentally at this stage with particles adhering to the sides of the feeder tube.

(5) Moist material dropped from a constant height gave a packing with greater density at the bottom than higher up.

In the case of dry particles without a fall, the surface friction is obviously considerable, certainly enough to prevent sliding in the depths of material met with in experimental work. One can foresee the possibility of crushing taking place under great weights. Shaking or knocking would tend to overcome this friction and hence settling may be expected.

When dry particles are dropped from a height the kinetic energy of the particles is enough to overcome some of the resistance, the greater the height the greater the kinetic energy, so that some graduation of density with height might be expected. The amount of consolidation obviously depends on surface roughness, density, and shape of the particles, and no general expression can be developed.

When the particles are moistened two things happen. First, if the particle is porous some of the moisture will be absorbed into the pores of the material. Secondly, some of the moisture will form a partial film over the surface of the particle. The proportion and quantity of water required for these two items varies with the porosity of the particle, the surface roughness, and the shape of the particle. Hence no general theory relating to them can be established. So long as any pores remain unfilled it is improbable that the surface will be fully coated with moisture, but as soon as no more water can be absorbed by the particle the film will spread rapidly over the whole surface. This film acts as a lubricant, hence it can be expected that at higher moisture contents some of the lower particles will tend to consolidate under the superimposed weight.

Summing Up

1. When moistening the dry material the height can be expected to increase according to some function of the moisture added. This curve may be influenced by the surface friction of the dry material, particularly with rough surfaces.

2. A maximum height is obtained when the surface of the particles is totally covered with the liquid film, and there is just sufficient surplus to cause capillary contact between all the particles. This may be called *No.* 1 *Critical Point.*

3. As more liquid is added the total weight of the material increases and causes compression of the particles.

4. When the proportion of liquid becomes considerable and the voids tend to fill up completely, the surface tensile force ceases to exert a resistance to the consolidating force. Further, the liquid acts as a lubricant reducing the frictional resistance of the particles so that consolidation can progress at a more rapid rate than before and to a greater degree than when full frictional resistance of the dry material is in operation.

Thus it may be expected the rate of this rapid diminution in volume will pass gradually from the rate according to case (3) up to an almost complete collapse until a minimum value is reached when the surface tension fails to influence the volume. This volume may be expected to be considerably lower than that of the dry material.

The point at which this rapid contraction commences may be termed *No.* 2 *Critical Point.*

Tests on Packing Density of Moist Materials

Tests were carried out to determine the depth of a given dry weight of packing material under carefully controlled conditions when moistened with varying degrees of moisture. As the cross sectional area was kept constant the depth was proportional to the volume and hence inversely to the degree of packing. The material was moistened with water and then dropped from a fixed height into the receiving vessel. The materials included closely graded silver sand, coarse river sand, spent oxide, new natural oxide, and new artificial oxide.

When porous materials were moistened sufficient time was allowed for the liquid to be absorbed into the pores before the tests were carried out.

Silver sand. The maximum volume was obtained with a moisture content of 7.5%, and the minimum was reached at 25%. No second critical point could be determined. This was probably due to the shape of the material, which was sharp edged.

River sand. The maximum volume was obtained with a moisture content of 6.5%, and the minimum was reached at 30%. Again, there was no second critical point.

* From a Paper to the North of England Gas Managers' Association (Auxiliary Section), Dec. 5.

† " GAS JOURNAL," 1936, 214, Apl. 15.

The final volumes of both kinds of sand were found to be below the normal dry volumes, and in each case some orientation of the particles had occurred at this degree of moisture.

New Dutch oxide. This material was porous and of rough irregular-shaped particles.

With the larger sizes there is a small second critical point. These sizes had a maximum value at approximately 35% moisture content, the actual value varying with particle size, and a minimum was reached at 60%.

With the smaller particles a more definite second critical point is observed.

The difference in value of the critical points is probably due to the fact that this natural material is irregular in constitution, the larger particles containing more fibrous material while the smaller particles were entirely mineral matter. The smallest particles below 0.005 in. were found to consist almost entirely of sand.

Spent oxide. The results with this material resembled sand more closely than the new oxide. This can be accounted for by the almost non-porous nature of the particles. No second critical point was found, the maximum volume varying between 9 and 15% according to the particle size, the larger particles requiring a higher moisture content so that the surface tension could overcome the weight. In each case the minimum volume was considerably below the dry volume, the minimum being reached at 40% moisture content.

Resistance to Gas Flow

The apparatus was designed to enable packing materials to be tested on a laboratory scale with conditions as near those on the plant as possible. It consisted of a vertical tube 2 in. internal diameter designed to hold a column of oxide 2 ft. deep, supported on a wire gauze screen, and gas was passed downwards through the material.

At the top and bottom of the column and at intervals of 6 in. in between were placed pressure rings each connecting eight holes $\frac{1}{16}$ in. diameter bored at equal distances round the circumference, and each ring was connected to a battery of " U " tube gauges, arranged to read differentially against the top pressure. The top ring was also connected to a gauge open to atmospheric pressure. This system enabled the pressure gradient through the column to be measured.

Thermometers were set in the gas stream above and below the packing to enable the temperature of the gas to be determined. The gas flow was measured by means of a Rotameter on which the calibration was checked from time to time by a wet meter and stop watch. When filling the tube with oxide the dry material was allowed to run from the bottom of a smaller tube without fall, the smaller tube being raised to allow the filling to pour out. In the case of the wet packings, this method was not practicable so the filling was carried out by dropping from a fixed height in close proximity to the level of the top of the packing. The velocity was calculated on the basis of the volume of gas passed divided by the full cross-sectional area of the container, and the pressure was read from the gauges in centimetres of water.

The method of determining the equivalent diameter of the particles was by counting out an appropriate number of particles, sufficient in number to weigh accurately. This was repeated four times and the average weight per particle was determined by displacement with water for the heavy materials and alcohol for the light materials, and from this was calculated the true density of the material and the weight and volume of one particle.

The flow was always kept low enough to ensure that the modified Reynolds number did not exceed 10.

The following observations are put forward:

(1) There is considerable difference in the friction value between spent oxide and new oxide. This is clearly due to the shape and internal porosity of the new material. As the new material is progressively wetted and the internal pores become filled with water, the effective surface area is reduced and the roughness of the surface gives place to the smoother water film. This causes a reduction in the friction, particularly in the case of the smaller particles, where at the limit the factor is approaching the same order as that of the spent oxide.

(2) In some cases an increase in resistance occured with oxide wetted beyond its saturation point. This was only of appreciable dimensions in the case of the smaller sized particles, and suggests that in these cases the films on the particles were close enough for bubbles to form across the interstices, so that additional resistance to gas flow was caused by the gas having to break through these bubbles.

(3) In the case of new oxide a slight moistening of the dry material causes an increase in the function value before the value begins to fall. No clear reason has been found for this, although it is possible that the surface of the damp material might be slightly roughened by very fine particles adhering to it. This suggestion is not considered reliable as at the moisture contents in question little capillary force occurred on the particle surface.

Conclusions

The most important conclusion from this work has been the influence of moisture content on the consolidation of the material. The optimum value for moisture to give the minimum resistance appears to be slightly greater than that to give the maximum voidage. This is due to decrease in surface friction when the suface is completely covered with water. As, however, the water will evaporate when gas is passed through it for any considerable time, the maximum voidage is clearly desirable when filling.

The moisture content is more sensitive with spent material than with new, and it is highly desirable to keep it within a narrow range of the optimum value.

The method of filling is also one of importance, and care should be taken to see that the oxide is not dropped from a height above the top of the layer.

It is important to note that the filling of boxes in a careful manner with material wetted to the correct degree and uniformly mixed will ensure low working pressure over a long period to an extent greater than any subsequent control can possibly effect.

GAS CONSUMER DEMANDS OF THE ENAMELLER*

By E. W. B. DUNNING, B.Sc., A.R.I.C., M.Inst.Gas E.,

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ALTHOUGH the gas appliance maker may be the buyer of enamel frit and plant, the ultimate user of the vitreous enamel is the housewife. It is obviously impossible for her to explain her requirements in person to the enameller, always supposing that she had a clear idea of what these requirements are. The gas undertaking can, however, take note of her suggestions and observe her use of gas appliances. The Gas Light and Coke Company is in close touch with its 1½ million users and this paper is based on the results of laboratory tests closely linked with this district experience.

Vitreous enamel is the most usual finish applied to domestic gas appliances, as it most readily satisfies the user's requirement of an easily cleaned surface which is heat resisting. The normal glossy surface is required for kitchen and bathroom equipment, but an easily cleaned matt surface would have decorative appeal for space heating appliances. Corrosion resistant surfaces are required for the flue-ways of gas appliances and the interior of flue equipment, although the user is not conscious of this requirement.

In these days when most comparisons with pre-war conditions are so unfavourable, it is interesting to note that enamel quality has greatly improved in all its properties. Neither the housewife nor the gas undertaking distinguishes between faults due to the enamel itself and those due to poor design of appliances or defective cast iron or steel. My remarks are therefore concerned with the complete enamelled article. Although I have tried to cover all types of appliances, most of my experience is with cooking appliances.

Enamel defects can be divided into two main groups—those which are present before the appliance is accepted by the user and those which occur in use. The Gas Light and Coke Company has drawn up a code of rules for the acceptance of vitreous enamel finishes. If no code is used there is a tendency for the supplier gradually to allow more and more flaws until the gas undertaking, becoming aware by complaints from the user, suddenly rejects almost everything and demands an almost impossibly high standard. Some discretion is, of course, necessary, as it is possible to accept more small defects in a mottled finish on a cheap appliance than on a self-colour high grade appliance. Defects which may develop later in use cannot be detected by visual observation of the user at the time of purchase. The test methods described in B.S.1344 have been devised to assess the wearing qualities of the enamel.

Visible defects may be present immediately the enamelled article is removed from the firing furnace, and these, although the easiest for the manufacturer to detect, are sometimes difficult to prevent. The sooner these defects are noticed and rejected the better. The cost of rejecting an unassembled part is only a fraction of the cost of replacing a part in the user's home with consequent loss of the consumer's satisfaction. The more important of these visible defects are as follows:

(i) *No enamel.* This most commonly occurs when the ground coat is exposed (*e.g.*, wiped edges, interior of flue pipe), and on subsequent

* From a Paper read before the 13th Annual Conference of the Institute of Vitreous Enamellers in Birmingham on Nov. 6.

firing of the cover coats this exposed ground coat is destroyed. Blisters, pinholes and perrett marks come into the same category. All lead to rusting and finally the destruction of the base metal.

(ii) *Small surface defects.* Specks, dimples, lumps, run down, fish scaling, copper heads, &c., are well known to the enameller, and much has been written in the technical literature on the causes and prevention of this type of defect. I feel that sometimes too much attention is given to avoiding minor blemishes. Much usable enamel is scrapped, ultimately at the user's cost, and much is given an extra coat with consequent greater risk of chipping.

(iii) *Marking.* There is a tradition that castings have to be marked to assist identification. When these castings are enamelled, raised letters may not be completely covered with enamel; generally all letters if covered with enamel cannot be read distinctly, and, more important, form grease and dirt traps in a supposedly "easy clean" surface. Sheet steel parts are seldom marked, as it is difficult to do, and seem to offer no more difficulty in identification. Where parts must be marked to instruct the user or give the maker's name, cannot a simple transfer or stencil be used? I am told that this means an extra firing, but I expect some ingenious enameller could get over this difficulty.

(iv) *Wiped edges.* The wiping of the cover coat from sharp bends, edges, and screw holes greatly minimizes chipping. Care must, however, be taken to avoid a "mourning card" effect. The ideal is to wipe the edges so that they pass unnoticed by the housewife.

(v) *Colour matching.* The housewife is definitely interested in coloured enamels, and the standardization of a limited range of colours as given in B.S.1358 should do much to enable her to obtain attractive colour schemes.

Castings and pressings give different shades, and adjustments must be made to obtain matching. Mottled enamels are more difficult to match, as so much depends on the operator. We have found the most satisfactory method of checking is to have two enamelled plaques, one the lightest allowable and the other the darkest. If the two plaques are mounted on a black ground with a hole between, through which the test sample can be viewed, it is easy to see by eye if the enamel under test comes within the two limits.

Colours are still regarded by the manufacturers as luxury finish, and flawless finishes are produced at high cost, although the extra cost of the enamel frit may be negligible. Lower costs with slight imperfections perhaps hidden by coloured mottling might be more acceptable to the bulk of our consumers.

The colours given in B.S.1358 appear adequate, but it would be advantageous if the standard British Colour Council names were included. Sales literature gives colours of appliances by name. The user buying an apple green coloured cooker from the gas showroom expects to obtain a reasonable match when she visits the ironmonger to buy apple green coloured saucepans.

Thin coatings have many advantages, but these must not be obtained at the expense of opacity. The user does not like to see the ground coat showing through the cover coat, even if the enamel is less likely to chip. Gloss is also important to the user, although not as yet covered by a specification.

Transport Defects

These occur after the appliance has been passed by the manufacturers' inspectors and before final acceptance by the user. By far the most important defect is chipping. The factors concerned are:

(i) *Enamel Quality.* Although adherence plays a part, thickness of enamel is probably the main consideration. A thick enamel coat probably resists the crushing action of a blow better than a thin coat, but if the blow results in deformation of the underlaying metal, then the thinner coat will take the resulting strain better. Thus impact testing machines which hold the enamel rigid show better results with thicker enamels.

Recent American results suggest that reduction in thickness of enamel greatly reduces chipping in transport. A single cover coat over the "grip" finish is now possible in this country, with an overall thickness of 0.01 in. The use of high titanium steel enables the grip coat to be dispensed with, and may reduce the overall thickness to under 0.005 in.—*i.e.*, the thickness of organic finishes. This steel is being used experimentally in America.

There is little doubt that a thick gauge metal base results in less chipping that a thin one. Comparisons between enamelled cast iron and sheet iron always assume that the sheet iron must be thin. Present plant is capable of turning out heavy-gauge pressings of excellent rigidity and without the irregular thickness of cast iron.

(ii) *Design.* Enamelled parts should not be used as load bearing structures; they are normally hung on to a frame work. Soft washers should be used under all screwheads. The use of large shaped pieces without joins reduce the number of sharp bends and bolting of enamel surfaces together. One-piece enamelled oven linings may be more costly to replace if chipped compared with separate parts, but the liability to chipping may be greatly reduced.

(iii) *Packing.* A balance must be struck between cost of packing and cost of damage. Elaborate crates or fabric covers have to be returned for re-use if the cost is to be kept reasonable, and this presents difficulty. Non-returnable packing has advantages, but has to be skilfully planned if the maximum protection is to be given with the minimum material. Many manufacturers take their prototype appliances "for a ride" and find that modifications to the appliance or packing suggested by this test greatly reduce the damage in transit.

(iv) *Care in transport.* In general road transport leads to less damage than rail, as with the latter shocks are set up due to mixed freight. We find little damage in transport from our stores to the consumer, as specially designed low vans, with two or three exits, are used. Little thought has been given to the ultimate stage, when a carman has to carry the appliance, generally a cooker, up a flight or so of stairs and often has little to grip.

Defects which Occur in Use

Up to this stage the manufacturer has control of the appliance, and can determine with some precision the reason for defects occurring. In use the appliance may or may not be given reasonable treatment; if, however, numbers of the same defect are reported from different users, then it is probable that the usage is normal and some action is required to obviate the cause of the defect. In the Gas Light and Coke Company all defects are recorded and tabulated so as to give this numerical weight to the various types of defects. The majority of users do not, however, report defects when they occur; they either accept them as inevitable and class them as normal wear and tear, or they do not trouble to complain, while registering a resolve to avoid that manufacture on future occasions and in recommendations to friends. Laboratory tests are made in accordance with B.S.1344 on samples of new appliances with the object of reducing the defects which occur in use. All these tests are not indiscriminately carried out on all parts. Tests are chosen in relation to use.

Life tests are also carried out in the laboratory. The appliance is arranged so that the gas is turned on and off automatically day and night and a few months' test may be equivalent to many years' use on the district. These tests, while valuable, do not exactly reproduce district conditions. They are supplemented by "home tests" in which appliances are installed in employees' homes and operated under normal conditions. Questionnaires are prepared by the laboratories and reports furnished every six months of the functioning of the appliances.

As a result of this laboratory and district experience the following observations can be made on the principal types of defect which occur in use:

(ii) *Mechanical chipping.* Once the appliance is installed, the greatest danger of mechanical chipping of the main structure is passed. Chipping is mostly confined to loose parts such as grill pans and crown trays which may be accidentally dropped. As mentioned earlier, increase in gauge of the supporting metal is probably the main method of reducing this defect. When the base metal is severely deformed, even the thinnest enamel coat will not stand the resultant strain. The loose parts can, however, be replaced more cheaply than the fixed parts, as with the latter work has to be done by the fitter on the premises.

(iii) *Thermal shock.* Crazing and subsequent chipping due to intermittent heating and cooling occur particularly on grill pans and crown trays, as they get heated and then quenched by liquids spilling on to them. A warning notice on the crown tray to the user to keep the grill pan in position under the grill when it is alight can only shift the crazing from one part to another and during the grilling process the pan must be removed for loading and inspection. Attention to the coefficients of expansion of enamel and underlying metal and reduction in thickness of the coating can do much to minimze this defect.

(iv) *Heat resistance.* Burning of the enamel, however severe has been the heat applied, is a cause of disappointment to the user. Much has been done to produce enamels more resistant to heat, but if the temperature in use approaches the original firing temperature changes are bound to occur. The solution is largely one of careful design so as to keep the temperature of enamelled surfaces below the critical temperature.

(v) *Staining.* Enamels that are acid and alkali resistant to B.S. tests are not likely to be attacked by any of the ordinary materials found in the kitchen. In this sense, the enamel can then be said to be "stainless." There is, however, another form of staining which is the cause of complaint, although the enamel qualty has little to do with it. This is the burning-on of spillage, &c., so that the user has difficulty in removing it. This is often reported as defective enamel although it can be demonstrated that the enamel is quite intact under the layer of deposit. The user has been led to believe that vitreous enamel is an easily cleaned surface, so this is, to her, defective enamel. Experiments have shown that the deposit becomes increasingly difficult to clean as the temperature increases from 200° C. to 270° C. and there is a marked difference in ease of cleaning for even a 25° C. rise in temperature. At higher temperatures than 270° C. the grease tends to burn off and the cleaning became less difficult. It thus seems clear that surfaces should either be kept as cool as possible (below 200° C.) or allowed to become so hot that the grease burns off. Tests

with different materials have shown that stainless steel is the easiest to clean, closely followed by vitreous enamel. There appears to be little difference between self colour and sponge or spray mottle enamel finishes.

Conclusions

While in general the quality of vitreous enamel is high there is still room for improvement.

The appliance manufacturer could do much by specifying that the enamel should satisfy British Standard 1344 and then carry out the necessary simple tests to ensure that the standard is being maintained.

The heat resistance and abrasion tests should be reviewed and made more severe, as enamels which pass these tests do not necessarily stand up to normal district usage. It has been shown that many defects are not due to the enamel *per se* but to incorrect design of the appliance.

Present developments to obtain thinner enamel coatings of high opacity should do much to reduce defects due to chipping in transport and to improve the thermal shock.

THE BEHAVIOUR OF REFRACTORY MATERIALS IN CARBONIZING PLANT*

By E. HEATON, Ph.D., A.R.I.C.

(Abstract from the 38th Report of the Refractory Materials Joint Committee, Gas Research Board Publication No. 32)

(Continued from p. 586)

LACK of adhesion was due to the development of cracks running parallel to the face of the refractory. These occurred in either (*a*) the carbon (as shown in Fig. 8), which left a thin layer of carbon on the surface (in the case illustrated less than 1/4000 in. thick); (*b*) the refractory (Fig. 9) resulting in a small flake of refractory being removed; or (*c*) at the boundary of the silica and scurf (Fig. 10).

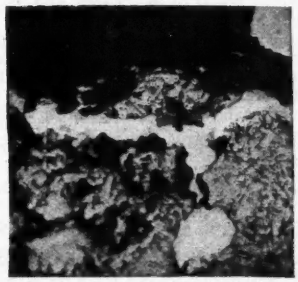


FIG. 9.—*Development of a Crack Within the Refractory which Resulted in a Small Flake of Silica being Removed.* (*Magnified* × 60.)

In the case illustrated in Fig. 9 the flake was only of the order of 1/5,000 in., and such a condition would not on the whole result in serious damage to the bricks. On the other hand, no damage at all would be done to the refractory if the crack developed at the boundary as in Fig. 10. The amount of carbon in the brick here was small, due, presumably, to the low permeability of the grog particle at this point.

When the scurf was firmly attached to the silica, such that its removal resulted in considerable damage to the refractory, there was a continuous carbon structure from the layer of scurf into the surface pores of the brick as is shown in Fig. 11, where the flake attached to the scurf was about ½ in. thick and covered an area of 3 or 4 sq. in.

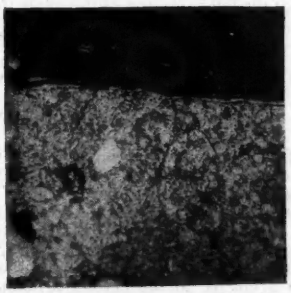


FIG. 10.—*Development of a Crack at the Boundary of the Scurf and the Refractory. This was caused by the lack of Penetration of Carbon into the surface Pores, in turn due to the relatively low Permeability of the Brick at this point.* (*Magnified* × 60.)

Fig. 12 is a thin section cut from a sample obtained at 7 ft. from the top of the retort, but containing only a very small amount of impregnated carbon. The carbon was concentrated in the surface of the silica, about ⅛ in. thick, and is clearly shown. In all the sections examined no evidence was found of the formation of low-melting compounds.

Table 5 gives the chemical analyses of three samples of lime-bonded silica material.

Sample W.—This was the surface material from samples heavily impregnated with carbon, obtained from 7 ft. down the retort.

Sample X.—This was surface material from 18 ft. down the retort. The layer was about ¼ in. thick and was grey in colour, similar to the surface layer from the sample only slightly impregnated with carbon 7 ft. down the retort. No analysis was done on material from the higher level due to the difficulty of obtaining a representative sample.

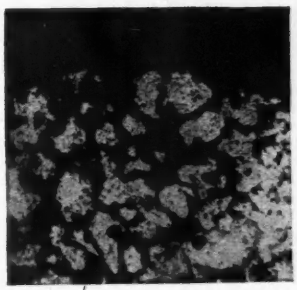


FIG. 11.—*Formation of a Continuous Carbon Structure Between the Scurf and the Refractory, which Resulted in Considerable Damage being done to the Brick.* (*Magnified* × 60.)

Sample Y.—This was from the same level as X, but from the body of the brick.

There appears to be a negligible increase in the glass content of the silica material, as represented by Sample W, compared with the original material. At the 18 ft. level, however, there was an increase in the glass in the surface material (Sample X), though it was relatively small and not appreciably greater than material obtained from the body of the brick (Sample Y).

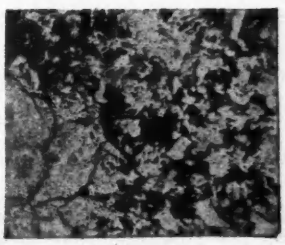


FIG. 12.—*A Small Amount of Carbon Existing in the Very Thin Layer of Material of Samples having no Scurf Attached. The Carbon Concentration was of the order of* 0.3%. (*Magnified* × 60.)

*Presented at the 13th Autumn Research Meeting of the Institution of Gas Engineers, 1947.

TABLE 5.—*Samples of Silica Material from the Bow Common Experiment*

Constituent	*W	X	Y
SiO_2	94.25	89.20	92.92
TiO_2	0.26	0.24	0.23
Al_2O_3	2.19	3.88	1.70
Fe_2O_3	0.80	3.00	2.19
CaO	1.66	2.41	2.14
MgO	0.06	0.46	0.18
$K_2O + Na_2O$ ...	0.39	0.57	0.69
Loss-on-ignition ...	0.15	0.12	0.23
Total	99.76	99.76	100.28

Discussion and Conclusions

Certain forms of attack of the refractory material in continuous vertical retorts affect the life of the retort more than others. Of those forms which are reported the following come into this category:

(1) Disintegration of the top firebrick and siliceous material, from 0 to 1 ft. 6 in. from the top of the retort.
(2) Flaking or spalling in zone 2, from about 4 ft. to 15 ft. from the top of the retort.
(3) Slag attack in zone 3, from the bottom of zone 2 to the bottom of the silica or siliceous material.

Variations in severity occur which are largely dependent upon local conditions.

Other types of deterioration, such as "crazing" in zone 1 and mechanical wear in zone 4, have been noted.

Failure of the constructional material in fairly well defined zones is perhaps common to all types of industrial plant, and to some extent the conditions which cause such failures must be inherent in the process. Flaking is peculiar to continuous vertical retorts, while slag attack is common to most high temperature industrial plant, although in continuous vertical retorts it always occurs in one position, the bottom half of the retort. The conditions which give rise to flaking are, therefore, peculiar to the method of carbonizing, while those which cause slag attack are only in part inherent in the method. In order that the life of the retort may be materially increased it is most important to obtain data on the nature of the operating conditions.

(1) *Disintegration*

At least three conditions exist at the top of a retort which may give rise to the disintegration of the refractory, viz.:

(1) Chemical attack due to volatile slagging agents.
(2) Carbon impregnation.
(3) The influence of the variations in temperature caused by the uneven travel of the charge.

Chemical analysis has shown that there is a small increase in the alkali content of the surface material. This, however, is not conclusive, and further evidence is necessary to support the view that disintegration is caused by chemical action. Although carbon is observed deposited in the pores of the brick there is not enough evidence to suggest that this causes disintegration.

On the other hand, all the samples examined contained a considerable amount of quartz. Measurements of temperatures 3 ft. from the top of the retort have shown that fluctuations occur in the brickwork, and that the temperature falls to below the α—β quartz inversion point on an average at least once a day. At the high level where failure occurs the frequency of variation will be greater. Recently, two samples were obtained from adjacent positions at the top of a retort. One, which showed considerable disintegration, contained a large amount of quartz, while the other contained very little quartz and was mechanically strong. Examination under the microscope showed that there was a tendency for a large number of cracks to develop in the quartz grains.

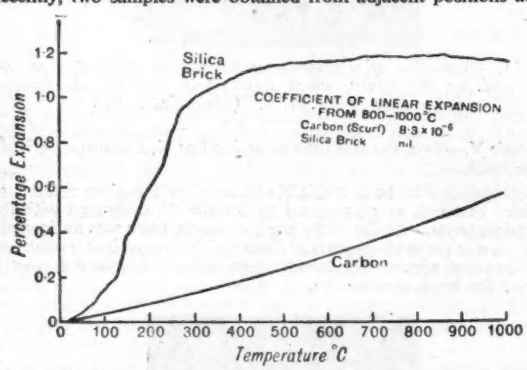


FIG. 13.—*Thermal Expansion Curves for Silica and Scurf (Retort Carbon)*

The position of the disintegrated material along the major axis depended largely upon the design of the top casting and was at the end of the retort which was most subject to rodding—*i.e.*, where the temperature variations were most frequent. Failure was not due to blows from the rodding tools, though these tended to dislodge some material.

Since all the disintegrated material contained quartz, and since factors which tended to increase temperature variations favoured an increase in the amount of disintegration, it is suggested that the disintegration of the firebrick and siliceous material at the top of the retort may be due to the frequent volume changes occurring at the repeated inversion of α—β quartz at 573° C. Further proof is necessary, and a laboratory investigation is being made of the subject.

(2) *Flaking and Spalling*

Flaking is restricted to the area in which scurf is formed and appears to be related to the characteristics of scurf formation.

In a previous investigation evidence was found of chemical attack upon the surface of the refractory by volatile slagging agents. During the scurfing operation the resultant high temperatures caused partial fusion, and this, together with the mechanical action of the scurf, tended to remove thin flakes of material.

In the present investigation, while some evidence of this type of attack was observed in the case of siliceous material, there was very little evidence of chemical attack in the case of lime-bonded silica. In some cases there was a slight increase in the iron content of the surface (Table 2), but the slag tended to diffuse into the brick without causing the surface to break away. It is possible, therefore, that in the case of lime-bonded silica material the scurf plays a more important part in causing deterioration.

In a number of samples of brickwork obtained from the retorts at Bow Common, the scurf was firmly attached to the silica. This is illustrated by Fig. 11, which shows the penetration of the scurf into the surface pores of the refractory. In this instance removal of the scurf resulted in a piece of silica ½ in. thick and covering an area of 3 or 4 sq. in. being broken away from the brick surface. Thus, a strong bond can develop between the scurf and the refractory.

At the surface of the brickwork 9 ft. from the top of the retort it has been shown that the average temperature is about 900° C. with a possible variation of ±70° C. Such variations in the temperature are due to the uneven travel of the charge, and, hence, the temperature fluctuation will be still greater in the scurf.

The thermal expansion curves for silica and scurf are shown in Fig. 13, the latter curve being from unpublished data by A. T. Green. At the working temperature of the retort the coefficient of thermal expansion of silica brick is nearly zero, while that of scurf is about 8.3×10^{-6}. Under the influence of temperature variations, differential expansion will therefore occur between the two materials.

If a strong bond exists between the scurf and the retort wall, as shown in Fig. 11, stresses may be set up of sufficient magnitude to cause fracture within the refractory. If, however, the scurf is weaker than the refractory, cracks will develop either in the scurf or at the boundary, as illustrated in Figs. 8 and 10, thus relieving any stresses in the refractory.

Such a stress system may be considered analogous to that present in thermal spalling, and, hence, should show some of the characteristic features of spalling. Generally, hard-burnt firebrick has a greater spalling tendency than soft fired material, and similarly lime-bonded silica material is more susceptible to this type of flaking than the clay bonded siliceous materials. An increase in the amount of viscous material in a refractory generally reduces its tendency to spall. In certain retorts the higher the slag attack extends up the end wall, the higher is the area subject to flaking (Fig. 4), while where the slag attack is very slight the whole of the end walls show signs of flaking. In one installation where flaking was possibly due to chemical attack, excessive slagging also reduced the amount of flaking.

In "horizontally" heated retorts the flaking was found to be relatively uniform, except for some tendency for it to be rather more severe in positions corresponding to the floor tiles dividing the flues (Fig. 2). The carbon penetration also decreased uniformly from the full thickness of the fall at the top of the retort to zero penetration about half way down.

In "downwardly" heated retorts the flaking of the silica was very slight as far down as the secondary air inlet. Below this, for a space of 1 to 2 ft., there was a sudden increase in the flaking to a maximum (Fig. 1) followed by a fairly rapid decrease, all the attack taking place opposite the flue division walls (not the flues) down to the bottom of the zone.

Examination of the scurf and carbon penetration in this type of retort showed considerable variation. The end walls, which in this case were very slightly flaked down to the bottom of the silica section, were heavily impregnated with carbon. The side walls in the firebrick section, 3 ft. 6 in. from the top, were also heavily impregnated, though no flaking occurred. Between this level and the secondary air inlet the conditions were reasonably the same and there was no reason to suspect a change in the carbon penetration. Moreover, the appearance of the flaked silica in this region was similar to that of the end walls. Hence, it is fairly reasonable to suppose that this silica also contained a considerable amount of carbon and that the limits of heavy penetration on the side walls were from the top of the retort down to the level of the secondary air inlet.

The sudden increase in the amount of flaking level with the secondary air inlet is most probably due to an equally sudden change in conditions possibly associated with the increase in temperature in the flues. Such an increase in temperature would result in:

* Calculation on the carbon-free sample. Carbon content 2.66%. (See Fig. 7.)

(*a*) an increase of the gas pressure in the flue;
(*b*) an increase in the viscosity of the gases in the retort; and
(*c*) a decrease in the density of the gases in the retort.

Factors (*a*) and (*b*) would tend to reduce the rate of flow of gases from the retort to the flues, and (*c*) would reduce the molecules in a given volume of gas available for decomposition to carbon and hydrogen. The quantity of carbon and the depth of penetration would thus tend to decrease in this locality.

At the same level on the inside of the retort, the magnitude of the temperature variations would, on the whole, be greater because of the higher wall temperatures.

Below the area of maximum attack (*i.e.*, where the flaking is confined to positions on the carbonizing surface opposite to the flue division walls), samples of brickwork from the retorts at Bow Common showed that parts of the wall were impregnated with carbon and had a considerable amount of scurf attached to the surface, while other parts had no carbon penetration and no scurf attached. Such a variation in the scurf formation and carbon penetration suggested a relationship with the correspondingly varying amounts of flaking observed in this zone. It is unfortunate that the exact location of the samples is not known, as they were all flaked to some extent. This was possibly because they were obtained from the boundary between the area of maximum flaking and the area where the flaking coincided with the flue division walls. Samples from rather lower down might have shown a clearer distinction between flaked and unflaked brickwork.

Thus, above the secondary air inlet the silica is probably fairly heavily impregnated with carbon, which is associated with only a small amount of flaking. Where the secondary air is admitted into the flues the conditions are such as to reduce the amount of carbon in the brickwork, and a large increase in the flaking is observed. Below this, where the flaking varies, the varying conditions of carbon penetration and scurf formation provide additional evidence for the close relationship existing between flaking and scurf formation.

To summarize, therefore, the points which support the hypothesis that flaking of lime-bonded silica material is due to the differential expansion between the scurf and silica are:

(*a*) The coefficient of thermal expansion of carbon is considerably greater than that of silica at the working temperature (about 900° C. on the retort face.
(*b*) Under certain circumstances a strong bond may develop between the scurf and the refractory.
(*c*) Temperature variations of up to 100° C. or more may occur in the scurf or the surface of the brickwork during the carbonizing period.
(*d*) During scurfing, temperatures at the brick-scurf interface may rise considerably above those existing at the time of the scurf deposition.
(*e*) There seems to be some relationship between the amount of flaking and the scurf, such that partial penetration of the carbon into the brick appears to be most favourable to flaking.
(*f*) The characteristics of flaking are to some extent similar to those of spalling.
(*g*) There is not enough evidence to suggest that chemical attack of the surface results in flaking. On the contrary, an increase in the viscous material consequent on the attack by slagging agents tends to decrease the flaking.

Calculation of stresses set up in refractories because of thermal gradients is complicated by the heterogeneous nature of the materials. In the case of scurf this heterogeneity may also be considerable due to the variable conditions under which scurf is formed. Because of this the determination of the stresses involved in the differential expansion between scurf and silica would be of small value. It is of some practical interest, however, to analyze the effect of the mechanical properties of the materials on the tendency to flake, and thus to find the general rules which must be followed in order to reduce flaking.

In an Appendix to the Paper an expression for flaking tendency is deduced which indicates that it will increase with (*a*) the area of the carbon-brick interface; (*b*) the difference in the coefficients of expansion of brick and scurf; (*c*) the magnitude of the temperature variations; and (*d*) an increase in the value of the moduli of rigidity of carbon and silica. The tendency to flake will likewise decrease with the increase in maximum shear strength of the silica and the thickness of the carbon and silica layers. It is also deduced that the flaking tendency is a function of the reciprocal of the maximum shear strain of the silica at the breaking point, or the flexibility.

The limited amount of data available on the mechanical properties of commercial silica and siliceous bricks adds further support to the hypothesis that flaking is in part due to the action of the scurf. Values of Young's modulus for lime-bonded silica bricks show a variation between about 5 and 25 $\times$ 10^5 lb. per sq. in. In the case of siliceous material, however, the modulus was 1.3 $\times$ 10^6 lb. per sq. in., and it was recorded that the sample was "very compressible." It has been observed that there is less tendency for this material to flake than lime-bonded silica, under the direct action of the scurf.

The evidence presented to show that the flaking of lime-bonded silica material is mainly due to the stresses set up by the differential expansion between carbon and silica, while not entirely conclusive, appears sufficient for it to be used as a working hypothesis.

Reduction in flaking may therefore be sought by:

(*a*) increasing the flexibility of the material;
(*b*) decreasing the magnitude of the temperature variations; and
(*c*) preventing penetration of the carbon into the brickwork.

The increasing of the flexibility of lime-bonded silica bricks is not straightforward. Perhaps something might be achieved by incorporating a larger proportion of prefired material. In any event, it is inadmissible to use lower temperatures for the kiln firing. Again, flexibility must not be obtained at the expense of increased porosity and permeability.

The substitution of a brick of low permeability will decrease the carbon penetration, but the reduction in permeability must be sufficient to reduce the carbon penetration to below that required to bond the scurf firmly to the brickwork. It may be necessary, therefore, to coat the surface of the retort with a non-permeable material in order to obtain this condition.

(3) *Slag Attack*

Attack by slagging agents was generally observed in the bottom half of the silica or siliceous material, though in some cases it extended a considerable distance up the retort.

The severity varied from a negligible amount in the bottom 12 in. of silica, to very severe attack almost to the top of the retort, as in retort B. Generally, it was most severe on and extended furthest up the end walls. "Downwardly" heated retorts, built of lime-bonded silica material, showed most attack on the end wall under the offtake, while "horizontally" heated retorts, also built of lime-bonded silica, showed more attack on the opposite end of the major axis (Fig. 4). This was probably due to the presence of secondary air flues adjacent to one or other of the end walls and having a cooling effect on the brickwork.

Generally, the gas tended to travel between the charge and the end of the retort, at either end of the major axis in preference to passing through the charge or in contact with the side walls. The corners of the retorts were the most severely attacked, possibly because of the scouring action of the gases, though it may also have been due to a higher temperature as a result of two radiating surfaces being adjacent. A considerable amount of erosion took place.

There was some indication that the use of steam promoted slag attack, though generally the retorts carbonizing the same types of coal exhibited similar amounts of attack.

The case has been described in which slag penetrated to a depth of ½ in. at the bottom of the retort on the end wall. This resulted in an extreme form of flaking because of chemical alteration of the surface, the material coming away from the wall in the form of a "blister."

The general character of the slags was interesting. Analysis of those formed with the lime-bonded silica material showed that they were rich in iron, the proportions of the other oxides being smaller to that of the original brick. At the surface they generally contained magnetite (Fe_3O_4), which during the working of the retort was probably in the form of ferrous oxide (FeO). Further away from the carbonizing surface there was a tendency for fayalite ($2FeO.SiO_2$) to form. These slags were very fluid and tended to penetrate the body of the brick.

The slags formed with siliceous material were found to contain relatively large amounts of the oxides of iron, sodium, and potassium. Generally, there was a tendency for crystals belonging to the triclinic wollastonite—$FeSiO_3$ solid—solution series to form, though a certain amount of fayalite was found in some samples. These slags were probably more viscous than those formed with lime-bonded silica material and did not diffuse as readily into the brick.

Diffusion of the slags formed with the lime-bonded silica did not materially weaken the refractory, and a certain amount of protection was afforded by the liquid coating the silica grains.

(4) *Conclusions*

Similar investigations to those presented in this Paper continue to be made. The various suggestions which have been offered to explain the deterioration of the refractory in different parts of continuous vertical retorts should only be considered as working hypotheses to be modified in the light of further evidence. During recent months other gas-works have been visited, and many of the observations made here have been confirmed. Much work is required, however, before all the types of deterioration of the refractory, and their causes, have been catalogued.

The British Standards Institution has just issued a further addition to the series of standard test codes, covering the testing of ovens and kilns firing pottery—B.S.1388, price 2s. 6d. This code provides for evaluating the performance and efficiency of ovens and kilns firing pottery, of the intermittent and continuous types and fired by solid fuel, liquid fuel, gas, or electric heating. The code covers a comprehensive test and a less detailed test for commercial purposes. The sections of the code cover the following broad headings: (1) General information and design data. (2) Test conditions. (3) Mean observations and preliminary deductions. (4) Thermal statement. (5) Kiln performance. Under each of these sections the items are listed, together with explanatory notes. Copies of this code can be obtained from the Publications Department, British Standards Institution, 24, Victoria Street, London, S.W.1.

PUBLICATIONS RECEIVED

Two new publications—Nos. M.471 and M.472—dealing respectively with Beaumont drag scrapers and skip hoists, and material handling, have been issued by International Combustion, Ltd., 19, Woburn Place, London, W.C.1. Both are of interest to gas engineers seeking increased efficiency on the works.

* * *

We have received from the periodical *Electrical Industries* two large wall maps of England and Wales. One, well printed in colour, is a graded supply map showing the areas of authorized distributors, output of undertakings, and the annual consumption per head of population, while the other, which is transparent, may be placed upon it to show the boundaries of area electricity boards, the selected stations and their inter-connecting grid lines.

* * *

Sulzer Technical Review (No. 2, 1947) is dedicated to the 50th anniversary of the Sulzer diesel engine and contains three long articles surveying the main fields of diesel application. After an introduction outlining the progress of the diesel engine since its invention, the first main article describes the development of the stationary Sulzer engine, which began in 1897 with the construction of a 20 h.p. unit and has led to the largest modern engines with outputs up to 14,000 h.p. A further contribution deals with the two-stroke marine engine, which was first realized in 1904. A further line of development, taken up in 1912, with the building of the first Sulzer diesel locomotive, is treated in an article on the Sulzer engine for rail traction. Finally a short account is given of the latest advance from the diesel engine to the gas turbine, with a report on the work so far done by the firm in this field. The shorter notes in the number mention a few outstanding motorships and also include descriptions of centrifugal pumping plants and a large steam boiler installation. The number is more than twice its usual size and is richly illustrated with drawings and photographs.

* * *

The first post-war edition of the *F.B.I. Register of Manufacturers*—the only complete guide to the members of the Federation of British Industries, their products and services—is now available. Published jointly by Kelly's Directories, Ltd., and Iliffe & Sons, Ltd., the 1947-48 edition lists over 5,000 of the foremost manufacturing organizations in Great Britain, and includes much entirely new information designed to appeal specifically to foreign buyers. Of particular importance are a Products and Services Section, with all F.B.I. members classified under 5,250 headings facilitating the rapid identification of supply sources, an Address Section comprising an alphabetical directory giving complete information on every member, and a Brands and Trade Marks Section enabling buyers to trace the makers of branded products; these are supplemented, from the overseas reader's viewpoint, by additional reference facilities in French and Spanish. Produced under an arrangement with the Federation of British Industries, the 1947-48 *Register* will provide valuable support for the export drive, its world-wide distribution including the principal buyers, importers, and shipping agents throughout the world, British Consuls and Commercial Attaches abroad, Trade Commissioners, Chambers of Commerce, &c. Distribution is being handled by Kelly's Directories, Ltd., 186, Strand, London, W.C.2, from whom copies are obtainable, price 2 guineas (special terms to F.B.I. members).

Fathers and mothers, uncles and aunts, in search of the right gifts for the youngsters' Christmas stockings can always include a book. The British Gas Council has produced a new kind of fairy story, with a particular appeal to all children from about five to nine years. This ideal bed-time book will keep them interested and amused. Written by Hugh and Sally Gee, *Pictures in the Fire* so skilfully combines entertainment with instruction that every young reader will accept it for what it really is—a delightful story book. The illustrations clinch its appeal—12 full page colour illustrations, for some of which special models were made and photographed in colour. The price is 3s. 6d.

* * *

The Society of Incorporated Accountants and Auditors has issued a booklet compiled for the Incorporated Accountants' Research Committee by F. Sewell Bray, F.C.A., F.S.A.A., and H. Basil Sheasby, M.B.E., F.C.A., F.S.A.A., entitled *Company Accounts under the Companies Act*, 1947. It contains a company balance sheet and profit and loss account or income and expenditure account as related to the requirements of the Companies Act, 1947, together with consolidated balance sheet and profit and loss account of a holding company and subsidiary companies. An appendix sets out the relevant sections of the Companies Act, 1929, remaining in force. All the accounting provisions of the Acts of 1929 and 1947 are thus present in the form most convenient for reference. The accounting provisions of the Companies Act, 1947, will be brought into full operation on July 1, 1948. The opportune appearance of this booklet will enable company directors, secretaries, and accountants, as well as practising accountants and solicitors, to become familiar with the new requirements. Some of the matter appeared in the October, 1947, issue of *Accountancy*. It is now reprinted with additional matter in a booklet of 32 pages with a stiff paper cover, at 2s. per copy, post free.

* * *

Mr. C. Roy Fowkes, A.R.I.B.A., A.M.T.P.I., A.I.B.D., with the assistance of the Research Department of Ewart & Son, Ltd., collected a great deal of information of value to all whose work is concerned with the supply of hot water. This information he marshalled into a logical sequence, adorning it with photographs, diagrams, and tables, until it was finally sandwiched between the neat orange and white covers of *Instantaneous Hot Water Supply by Gas*, published by Ewart & Son, Ltd. Opening with an account of the development of the gas geyser, an analysis of hot water supply with brief descriptions of the appliances available, their advantages, consumptions, and deliveries, the reader is assisted in his choice of appliance, whatever his requirements may be. The relative capabilities of solid fuel, electrical and gas appliances are weighed with fairness, it being finally argued that, in many instances, gas fills the bill most efficiently. That decided, the relationship between the gas geyser and the layout of the premises is pursued, leading into a lengthy and detailed survey of flue requirements, materials and components available. Gas installation, including sizes and discharge rates of pipe, is similarly treated in detail and the book concludes with sections on modern requirements, the function of the geyser as an auxiliary, maintenance, bye-laws and regulations, and a useful glossary. Excellently presented, illustrated, and printed, this is a worthy addition to the bookshelf.

The autumn-winter number of *Smokeless Air*, the official journal of the National Smoke Abatement Society, surveys the Edinburgh conference of the Society, to which reference was made in the "JOURNAL" of Nov. 12, and reviews the Pulverized Fuel Conference held under the auspices of the Institute of Fuel at Harrogate earlier in the year.

* * *

The L.M.S. Railway is unique among the British railway companies in possessing as part of its organization a scientific research department which acts as the scientific consultant for all branches of the railway. It has been built up on sound lines and to-day its staff numbers nearly 200, comprising six main sections, concerned respectively with engineering, metallurgy, paint technology, physics, textiles, and chemistry. A 24-page brochure entitled *The Scientific Research Department of the L.M.S*, which has been prepared by the Company for the guidance and information of visitors to the research headquarters at Derby, gives a general survey of the work of the Department, which was formally opened in 1935 by Lord Rutherford of Nelson.

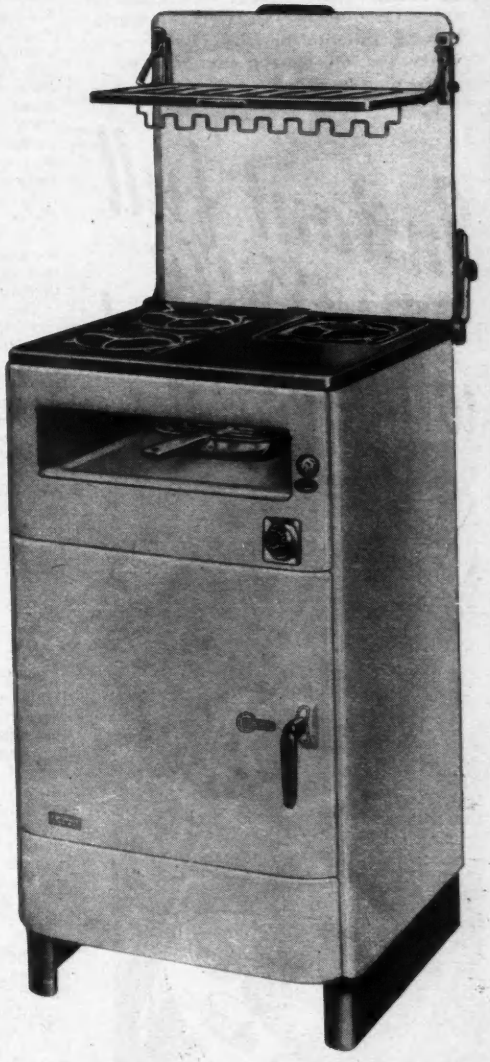
* * *

National and industrial fuel economy calls for the practical application of that branch of fuel technology dealing with combined heat and power producing installations. The design of such installations aims at the simultaneous production of all the power and all the process heat requirements in a factory or a group of factories with no wasted surplus and with particular attention to the fullest utilization of the latent heat of steam. To help engineers, factory managers and others, as well as for the benefit of students, D. L. Copp, Engineer of the Hornsey Gas Company, has written *Power and Process Steam Engineering* (Edward Arnold & Co., 15s.). A notable feature of the book is a chapter on the planning of a new installation, in which it is shown that a multiplicity of small steam-driven units is most uneconomical. Another particularly useful chapter is one dealing with the improvement of existing installations.

COMPANY NEWS

Low Temperature Carbonisation, Ltd.—The accounts for the year ended Mar. 31 last show that the trading profit of the Company and four of its subsidiaries, after depreciation, amounted to £267,113 (against £194,892 for 1945-46). After providing £17,357 (£13,145) for the net loss of a subsidiary there was a credit balance of £249,756, compared with £181,747 a year earlier. Taxation absorbed £115,018 (£78,870), and profits retained by subsidiaries amounted to £7,410 (£7,048), leaving the parent's net profit at £112,423—an increase of £30,923 on the year. The Ordinary distribution is 10% (against 6%). Forward, £85,490 (£61,218 brought in). The consolidated balance sheet discloses that profits carried forward and sundry reserves amounted to £376,000, and current assets totalled £1,063,000, while current liabilities were £241,000. The report announces an agreement with the National Coal Board formally excluding from coal nationalization all assets of the group except one colliery. It refers also to great assistance rendered by the Board in respect of coal supplies and other matters of joint concern. This co-operation should enable the Company to go ahead with full development of its coal distillation process, which provides smokeless fuel and numerous by-products. Higher output was mainly responsible for increased group earnings in the past year.

Why the No. 1430 raises even New World cooking standards



There are many important new developments in the NEW WORLD No. 1430 Gas Cooker which raise its cooking standards to even higher NEW WORLD levels. Chief of these are: its Air-Float Oven, which reduces heat leakage by conduction to a minimum; its Spring-Sealed Door, with flexible bedding for tightly-sealed closure; and, of course, its Regulo automatic oven temperature control.

These are but three of the ten features—listed below—which justify the claim that the No. 1430 is the best NEW WORLD Gas Cooker yet produced.

10 points of supremacy

1 Elegant in appearance
2 Easy to clean
★ 3 Cooks to perfection
4 Saves Gas
5 Air-Float Oven heats quickly
6 Spring-Sealed Door conserves heat
7 Regulo controls oven temperature
8 Chassis construction for strength
9 Leak-proof Vertico taps
10 Easy action platerack and Covertop

NEW WORLD Gas Cooker

(Model No. 1430)

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